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NASA SP-7011 (391)
August 1994

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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

National Aeronautics and Space Administration
Scientific and Technical Information Program
Washington, DC 1994

This publication was prepared by the NASA Center for AeroSpace Information,
800 Elkridge Landing Road, Linthicum Heights, MD 21090-2934, (301) 621-0390.

INTRODUCTION

This issue of *Aerospace Medicine and Biology* (NASA SP-7011) lists 75 reports, articles, and other documents recently announced in the NASA STI Database. The first issue of *Aerospace Medicine and Biology* was published in July 1964.

Accession numbers cited in this issue include:

Scientific and Technical Aerospace Reports (STAR) (N-10000 Series)	N94-31414 — N94-33356
Open Literature (A-10000 Series)	None in this issue

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which humans are subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Applied research receives the most emphasis, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the publication consists of a standard bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged by *STAR* categories 51 through 55, the Life Sciences division. The citations include the original accession numbers from the respective announcement journals.

Seven indexes—subject, personal author, corporate source, foreign technology, contract number, report number, and accession number—are included.

A cumulative index for 1994 will be published in early 1995.

Information on availability of documents listed, addresses of organizations, and CASI price schedules are located at the back of this issue.

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TABLE OF CONTENTS

Category 51 Life Sciences (General) 227

Category 52 Aerospace Medicine 229
Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

Category 53 Behavioral Sciences 233
Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

Category 54 Man/System Technology and Life Support 237
Includes human engineering; biotechnology; and space suits and protective clothing.

Category 55 Space Biology 241
Includes exobiology; planetary biology; and extraterrestrial life.

Subject Index A-1
Personal Author Index B-1
Corporate Source Index C-1
Foreign Technology Index D-1
Contract Number Index E-1
Report Number Index F-1
Accession Number Index G-1
Appendix APP-1

TYPICAL REPORT CITATION AND ABSTRACT

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ACCESSION NUMBER → **N94-11045*#** Pennsylvania State Univ., Hershey. Coll. of Medicine. ← CORPORATE SOURCE

TITLE → **EFFECTS OF CSF HORMONES AND IONIC COMPOSITION ON SALT/WATER METABOLISM Final Technical Report, 1 Mar. 1981 - 31 Dec. 1992**

AUTHOR → WALTER B. SEVERS 31 Dec. 1992 32 p ← PUBLICATION DATE

CONTRACT NUMBER → (Contract NCC2-127)

REPORT NUMBERS → (NASA-CR-193232; NAS 1.26:193232) Avail: CASI HC A03/MF A01 ← AVAILABILITY AND PRICE CODE

The consequences of headward fluid shifts during manned spaceflight was studied. Such shifts were recognized early by both U.S. and Soviet scientists because of signs and symptoms referable to the head. Some of these include disturbed vision, puffiness in the face and periorbital areas, headache, vestibular dysfunction, and distended jugular veins. We posited that the fluid shift had an immediate effect on the brain and a long-term action requiring a neural interpretation of the flight environment. This would re-adjust both efferent neural as well as hormonal mechanisms to sustain cardiovascular and fluid/electrolyte balance consonent with survival in microgravity. Work along these lines is summarized. A synopsis of some of the main research is presented. The following topics were studied: (1) angiotensin and vasopressin action in the central nervous system; (2) intracranial pressure control; (3) research on subcommissural organ; and (4) research on the eye.

Author (revised)

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 391)

August 1994

51
LIFE SCIENCES (GENERAL)

N94-31533# Amsterdam Univ. (Netherlands).
SPECTRAL INHOMOGENEITY OF THE BACTERIAL LIGHT-HARVESTING ANTENNAE: CAUSES AND CONSEQUENCES Ph.D. Thesis
FRANK VANMOURIK 1993 125 p Sponsored in part by Netherlands Organization for Scientific Research, and United Kingdom Science and Engineering Research Council
(Contract EEC-SC1-0004-C)
(ETN-94-96020) Avail: CASI HC A06/MF A02

A general introduction to bacterial photosynthesis, light harvesting, the importance of exciton interaction, exciton theory, the disordered dimer, and larger aggregates (LH-1), is presented. The following studies are then reported: exciton interactions in the light harvesting antenna of photosynthetic bacteria studied with triplet singlet spectroscopy and singlet triplet annihilation on the B820 subunit form of Rhodospirillum rubrum; spectroscopic characterization of the low light B800-850 light harvesting complex of Rhodopseudomonas palustris, strain 2.1.6; self assembly of the LH-1 light harvesting antenna of Rhodospirillum rubrum, a time-resolved study of the aggregation of the B820 subunit; excitation transfer dynamics and spectroscopic properties of the light harvesting BChl a complex of Prosthecochloris aestuarii; spectral inhomogeneity of the light harvesting antenna of Rhodospirillum rubrum probed by T-S spectroscopy and singlet triplet annihilation at low temperatures; and energy transfer and aggregate size effects in the inhomogeneously broadened core light harvesting complex of Rhodobacter sphaeroides. ESA

N94-32226 Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Analysis, Algebra and Geometry.
ON THE RECIPROCAL RELATIONSHIP BETWEEN LIFE HISTORIES AND POPULATION DYNAMICS
ODO DIEKMANN (Leiden Univ., Netherlands.) and J. A. J. METZ (Leiden Univ., Netherlands.) May 1993 16 p Submitted for publication Sponsored by Netherlands Organization for Applied Scientific Research TMO Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(ISSN 0924-2953)
(CWI-AM-R9302; ETN-94-96166) Copyright Avail: Issuing Activity (European Space Agency (ESA))

A possible mathematical framework for dealing with the following reciprocal questions is presented: how life history mechanisms shape the size and structure of populations; and how past population dynamics may have molded present day life histories. This framework is thought to be more general than comparable frameworks presented in the past; still sufficiently well specified to allow a directed search for both general theorems and tractable special cases; and still considerably less encompassing than one would wish. Within that framework, possible technical approaches to the questions above are discussed. Speculations about possible extensions to larger biological contexts are made in conclusion. ESA

N94-32228 Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Analysis, Algebra and Geometry.
THE LEGACY OF KERMACK AND MCKENDRICK
O. DIEKMANN (Leiden Univ., Netherlands.), J. A. P. HEESTERBEEK (Cambridge Univ., England.), and J. A. J. METZ (Leiden Univ., Netherlands.) Jul. 1993 18 p Submitted for publication Sponsored by Netherlands Organization for Applied Scientific Research TMO Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(ISSN 0924-2953)
(CWI-AM-R9304; ETN-94-96168) Copyright Avail: Issuing Activity (European Space Agency (ESA))

Starting from the pioneering work by Kermack and McKendrick of 1927, issues of interest in deterministic epidemic modeling are reviewed. These include: classification of dynamics, the influence of heterogeneity, and submodels for the contact process. ESA

N94-32267# Washington State Univ., Pullman.
TOWARDS A DETAILED UNDERSTANDING OF THE STRUCTURAL VARIABILITY IN LIGNINS: A NEW APPROACH
N. G. LEWIS and G. H. N. TOWERS 1993 16 p
(Contract DE-FG06-91ER-20022)
(DE94-007449; DOE/ER-20022/T1) Avail: CASI HC A03/MF A01

This reporting period witnessed a number of exciting and important breakthroughs in the study of lignin synthesis in plants and resulted in a significant deviation from the work plan originally proposed. Taken together, the authors' results reveal an emerging picture of a highly ordered assembly of the lignin polymer at the plasma membrane/cell-wall interface, in contrast to original considerations projecting a random series of coupling reactions. The Progress Report is divided into two sections: the first section reflects the interlocking research completed to date in the laboratories of N.G. Lewis and G.H.N. Towers. In the broadest sense, the Lewis group has focused mainly on woody plants, whereas the Towers laboratory examined similar processes in cereals/grasses. The second section compiles published work, a summary of manuscripts in preparation, and work currently underway for year three of the existing grant. DOE

N94-32269# Sandia National Labs., Livermore, CA.
A GENETIC ALGORITHM BASED METHOD FOR DOCKING FLEXIBLE MOLECULES
R. S. JUDSON, E. P. JAEGER, and A. M. TREASURYWALA Nov. 1993 38 p
(Contract DE-AC04-76DR-00789)
(DE94-007525; SAND-93-8688) Avail: CASI HC A03/MF A01

The authors describe a computational method for docking flexible molecules into protein binding sites. The method uses a genetic algorithm (GA) to search the combined conformation/orien-

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tation space of the molecule to find low energy conformation. Several techniques are described that increase the efficiency of the basic search method. These include the use of several interacting GA subpopulations or niches; the use of a growing algorithm that initially docks only a small part of the molecule; and the use of gradient minimization during the search. To illustrate the method, they dock Cbz-GlyP-Leu-Leu (ZGLL) into thermolysin. This system was chosen because a well refined crystal structure is available and because another docking method had previously been tested on this system. Their method is able to find conformations that lie physically close to and in some cases lower in energy than the crystal conformation in reasonable periods of time on readily available hardware. DOE

N94-32516# Princeton Univ., NJ.
DEVELOPMENT AND APPLICATION OF PHOTOSENSITIVE DEVICE SYSTEMS TO STUDIES OF BIOLOGICAL AND ORGANIC MATERIALS
S. M. GRUNER and G. T. REYNOLDS 14 Sep. 1993 11 p
(Contract DE-FG02-87ER-60522)
(DE94-008503; DOE/ER-60522/7) Avail: CASI HC A03/MF A01

This progress report summarizes results, as of August 1993, for DOE grant DE-FG-02-76ER60522 during the fiscal period 1/1/93 to 12/31/93, which is the first year of a 3-year grant cycle. The overall goals of the grant are to develop advanced x-ray detector technologies, especially as applicable for biological and materials research at the national laboratories, and to train graduate and post-doctoral students on the use of these technologies via the performance of original biological and materials research. As summarized below, there has been good progress toward achieving the research goals of the original 3-year proposal; in consequence, the research plan and the total budget for the rest of 1993 and beyond is still well described by the original proposal. Accomplishments since the last progress report include: (1) A 1k x 1k fiber optically coupled CCD detector was assembled, tested at CHESS and is slated for extended user trials this Fall. A 2k x 2k CCD detector is being assembled for permanent installation at CHESS. (2) X-ray detector phosphors, calibration techniques, and system software have been developed. (3) The design of a Pixel Array Detector, a collaborative project with the Advanced Photon Source, has been initiated. (4) The properties of biomembrane lipids under extremes of pressure have been investigated. High pressure instrumentation and techniques have been developed. (5) The physics of mesophase formation in biomembrane lipid, surfactant, and polymeric systems have been studied. This includes study of the interaction of membrane proteins with elastically strained lipid bilayers. (6) Work has been initiated on the use of thermal diffuse scatter from proteins as a probe of protein dynamics. (7) Studies on luminescent phenomena have been reported. Since the last progress report (dated 15 May 1992), this work has resulted in 10 published papers, 7 abstracts, 1 Ph.D. thesis and 1 technical report. DOE

N94-32622 Illinois Univ., Urbana. Dept. of Cell and Structural Biology.
THE ORGANIZATION OF THE SUPRACHIASMATIC CIRCADIAN PACEMAKER OF THE RAT AND ITS REGULATION BY NEUROTRANSMITTERS AND MODULATORS Final Technical Report, 1 Apr. 1990 - 30 Sep. 1993
MARTHA U. GILLETTE, DONG CHEN, STEVEN DEMARCO, JIAN DING, and LIA FAIMAN 2 Feb. 1994 62 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract AF-AFOSR-0205-90)
(AD-A277324; AFOSR-94-0047TR) Avail: CASI HC A04

Our research addresses the cellular organization and regulation of a biological clock that controls daily (circadian) rhythms of behavior (e.g., performance), physiology and metabolism in mammals. This clock, located in the brain's suprachiasmatic nucleus (SCN), can be removed in a slice of hypothalamus, maintained in a life support system for up to 3 days and studied directly. Using this approach, progress in the 3 1/2 years of this award has been made in: (1) localizing time-keeping properties within the SCN of rat, (2) identifying electrophysiological properties of neurons in the major SCN subdivisions, (3) establishing regulatory roles for serotonin, a neuromodulatory input from the brain's arousal center in the raphe nuclei, as well as for neuropeptide Y, an input from the intergeniculate area, (4) determining the level of glutamic acid decarboxylase (GAD), the biosynthetic enzyme for the inhibitory neurotransmitter GABA, in SCN over the circadian cycle, and (5) examining the involvement of glutamate/nitric oxide signal transduction in mediating light entrainment of the SCN through retinal inputs. This project involves both individual and interactive research projects at the University of Illinois and the USAF School of Aerospace Medicine. DTIC

N94-32769 California Univ., Santa Cruz.
NINTH INTERNATIONAL WORKSHOP ON PLANT MEMBRANE BIOLOGY
1993 285 p Workshop held in Monterey, CA, 19-24 Jul. 1992 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract DE-FG03-92ER-20081)
(DE94-005690; CONF-9207229) Avail: CASI HC A13

This report is a compilation of abstracts from papers which were discussed at a workshop on plant membrane biology. Topics include: plasma membrane ATP-ases; plant-environment interactions, membrane receptors; signal transduction; ion channel physiology; biophysics and molecular biology; vacuolar H+ pumps; sugar carriers; membrane transport; and cellular structure and function. DOE

N94-32890# Clemson Univ., SC. Dept. of Biological Sciences.
THE MAGNESIUM CHELATION STEP IN CHLOROPHYLL BIOSYNTHESIS
J. WEINSTEIN Feb. 1994 19 p
(Contract DE-FG09-89ER-13989)
(DE94-008727; DOE/ER-13989/4) Avail: CASI HC A03/MF A01

Mg-chelatase catalysis is the first step unique to chlorophyll synthesis, namely the insertion of magnesium into protoporphyrin IX. When pea (Pisum sativum L., cv. Spring) chloroplasts are lyzed in a buffer lacking magnesium and the thylakoids removed by centrifugation, the remaining mixture of light membranes and soluble proteins (LM/S) has high Mg-chelatase activity. Several lines of evidence are presented to show that the magnesium insertion catalyzed by this preparation is a two-step reaction consisting of activation followed by magnesium chelation. An activated state of Mg-chelatase is achieved by preincubating LM/S with ATP. The activated state is observed as the elimination of the approximately 6 min lag in the rate of magnesium chelation upon addition of the prophyrin substrate. The activity of LM/S assayed at low protein concentrations can be greatly enhanced by preincubating at high protein concentrations (12 mg/ml is optimal). This activation effect requires the presence of both LM and S fractions, as well as ATP. Both steps require ATP, but at different concentrations; the first step is optimal at greater than 0.5 mM (EC(sub 50) = 0.3 mM) and the second step is optimal at 0.3 mM (EC(sub 50) less than 0.2 mM). ATP in the first step could be replaced by ATP(gamma)S; this analog could not sustain activity in the second step. This activated state was stable for at least 30 min at room temperature, but chilling of preincubated LM/S on ice for 30 min caused an almost complete loss of the activated state. DOE

N94-32896# Brookhaven National Lab., Upton, NY.
LIGHT UTILIZATION AND PHOTOINHIBITION OF PHOTOSYNTHESIS IN MARINE PHYTOPLANKTON
P. G. FALKOWSKI, R. GREENE, and Z. KOLBER 1993 49 p Presented at the 41st Harden Conference on Photoinhibition of Photosynthesis, London, England, 5-10 Sep. 1993
(Contract DE-AC02-76CH-00016)
(DE94-005505; BNL-49821; CONF-9309312-1) Avail: CASI HC A03/MF A01

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Based on the record of the oldest identifiable fossils, the first oxygenic photosynthetic organisms appeared about 2 x 10(exp 9) years ago in the form of marine single celled, planktonic procaryotes. In the intervening eons, phytoplankton have evolved and diversified; presently they represent at least 11 classes of procaryotic and euacaryotic photoautotrophs. While the carbon of these organisms cumulatively amounts to only 1 to 2% of the global plant biomass, they fix between 35 and 50 gigatonnes (x 10(exp 9) metric tons) of carbon annually, about 40% of the global total. On average, each gram of phytoplankton chlorophyll converts about 6% of the photosynthetically active radiation (440 to 700 nm) incident on the sea surface to photochemical energy. Despite a great deal of variability in ocean environments, this photosynthetic conversion efficiency is relatively constant for integrated water column production. Here we review the factors determining light utilization efficiency of phytoplankton in the oceans and the physiological acclimations which have evolved to optimize light utilization efficiency. DOE

N94-33098# Kentucky Univ., Lexington. Dept. of Pathology.
CHARACTERIZATION AND UTILIZATION OF OPIATE-LIKE HIBERNATION FACTORS Report, 15 Jul. 1992 - 15 Dec. 1993
PETER R. OELTGEN 8 Dec. 1993 69 p
(Contract DAMD17-92-C-2026; DA PROJ. 3M1-62787-A-874)
(AD-A278136) Avail: CASI HC A04/MF A01

A hibernation induction trigger (HIT) molecule derived from the plasma of deeply hibernating woodchucks exerts profound effects mimicking a hibernation-like state when infused I.C.V. or I.V. in primates. The profound opiate-like behavioral and physiological depression occurring shortly after the infusion of the HIT-containing albumin fraction include hypothermia, bradycardia, long-term hypophagia and markedly depressed renal function. All of the aforementioned effects are reversed or retarded by the infusion of the opiate antagonists, naloxone and naltrexone. Such evidence enforces our hypothesis that the HIT molecule is not specific for hibernators, but that it may initiate its action through specific opioid receptor(s). We have shown that only DADLE, a delta class of opiate, could induce hibernation in summer-active ground squirrels (the traditional bioassay) in a fashion similar to those injected with HIT. Such evidence indicates that this delta opioid mimics the action of the HIT molecule and may be intimately involved in natural winter and summer-induced hibernation. Recently, we have developed a rapid in vitro bioassay utilizing the criteria of DNA and protein synthesis inhibition to monitor the metabolic inhibitory activity of hibernating plasma, and plasma fractions as well as the metabolic effects of the delta opioids DADLE and D-Pen 2.5-Enkephalin (DPDPE). DTIC

N94-33250 Technical Univ. of Denmark, Lyngby.
FUTURE DIRECTIONS OF NONLINEAR DYNAMICS IN PHYSICAL AND BIOLOGICAL SYSTEMS. (PHYSICA D NONLINEAR, VOLUME 68, NUMBER 1)
P. L. CHRISTIANSEN, J. C. EILBECK, and R. D. PARMENTIER 15 Sep. 1993 196 p Limited Reproducibility: More than 20% of this document may be affected by poor print and microfiche quality
(Contract DAJA45-92-M-0163)
(AD-A278085; R/D-6891-MA-02) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

Early in 1990 a scientific committee was formed for the purpose of organizing a high-level scientific meeting on future directions of nonlinear dynamics in physical and biological systems, in honor of Alwyn Scott's 60th birthday (December 25, 1991). As preparations for the meeting proceeded, they were met with an unusually broad-scale and high level of enthusiasm on the part of the international nonlinear science community, resulting in a participation by 168 scientists from 23 different countries in the conference, which was held July 23 to August 1 1992. The contributions to this present volume have been grouped into the following chapters: solitons, superconducting devices, biomolecular dynamics, nonlinear optics, and classical and quantum mechanical lattice dynamics. DTIC

52
AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

N94-31414* National Aeronautics and Space Administration, Washington, DC.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 388)
May 1994 59 p
(NASA-SP-7011(388); NAS 1.21:7011(388)) Avail: CASI HC A04

This bibliography lists 132 reports, articles and other documents introduced into the NASA Scientific and Technical Information Database. Subject coverage includes: aerospace medicine and physiology, life support systems and man/system technology, protective clothing, exobiology and extraterrestrial life, planetary biology, and flight crew behavior and performance. CASI

N94-31490# Acoustical Society of America, New York, NY.
MINUTES: ACCREDITED STANDARDS COMMITTEE ON BIOACOUSTICS, S3. US TAG FOR ISO/TC 43, ACOUSTICS, IEC/TC 29 ELECTROACOUSTICS, AND ISO/TC 108/SC4 HUMAN EXPOSURE TO MECHANICAL VIBRATION AND SHOCK
7 Oct. 1993 88 p Meeting held in Denver, CO, 7 Oct. 1993
(AD-A276201) Avail: CASI HC A05/MF A01

The following topics are presented: (1) approval of the minutes of the Ottawa, Canada meeting held 20 May 1993 (S1/384); (2) organization; (3) standards approved by ANSI in 1992/1993 and published (or being published) by ASA; (4) organizational matters and reports on working groups, including reports on letter ballots and international matters; (5) S3 liaison working groups; (6) international matters; (7) review of standards more than five years in existence; (8) new international standards available; (9) procedural ballots; (10) other business; (11) new business; (12) future meetings; and (13) adjournment. DTIC

N94-31652# Universiteit Twente, Enschede (Netherlands).
PERSPECTIVES OF GLUCOSE SENSING BASED ON A CHARGE-MODULATING COMPETITION REACTION Ph.D. Thesis
JANS KRUISE 1993 164 p Sponsored by Ministry of Economic Affairs
(ISBN-9-09-005754-4; ETN-94-96030) Avail: CASI HC A08/MF A02

Diabetes mellitus is introduced, existing detection principles for glucose sensors are reviewed, and a method based on a charge modulating competition reaction for measurement of glucose dependent concentration of either oxygen, hydrogen peroxide or gluconic acid, as opposed to an enzyme based glucose sensor, is proposed. The detection principal, based on a competition reaction between glucose and a charged glucose derivative, is described. Both species can bind to receptor molecules present in a porous membrane. Due to the competition reaction, the concentration of bound charged glucose derivative depends on the glucose concentration in the sample solution. The aim is to find a method to detect this glucose dependent concentration of bound charged groups in the receptor membrane. The development of a Donnan potential across the membrane solution interface is modeled. Optimal system parameters, which lead to a maximum sensitivity of the Donnan potential towards changes in glucose concentration, are derived. The feasibility of static potentiometric detection of a Donnan potential with an ISFET based device is discussed. ISFET based membrane conductivity and miniature conductivity sensor are described. Measurement results of membranes in which the bound charge (of charged glucose derivatives) can be modulated by glucose are given. The membranes were characterized using the so called ion

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step method. This method was also used to prove the operation of the competition reaction between glucose and the charged glucose derivative. The effect of changes in glucose concentration on the membrane conductivity was investigated. ESA

N94-31738 Defence and Civil Inst. of Environmental Medicine, North York (Ontario).
PROCEEDINGS OF THE DCIEM DIVER THERMAL PROTECTION WORKSHOP
R. Y. NISHI, ed. Jan. 1992 218 p Workshop held in North York, Ontario, 31 Jan. - 2 Feb. 1989
(DCIEM-92-10; DSIS-92-03143; CTN-94-61181) Avail: Issuing Activity (Defence and Civil Inst. of Environmental Medicine, 1133 Sheppard Ave. W., P.O. Box 2000, North York, ON M3M 3B9 Canada)

As a result of a renewed interest in diver thermal protection, a workshop was organized under the auspices of the America, Britain, Canada, and Australia Information Exchange Program on Naval Diving in order to bring together representatives from all the components associated with military diving. Papers were presented at the workshop on active and passive diver thermal protection, medical implications of diving in cold water, diving suit buoyancy characteristics, thermal insulation materials, diving suit undergarments, hot-water heating and electrical heating of diving suits, improvement of cold tolerance in humans, thermoregulation, diver monitoring systems, and test facilities. Separate abstracts have been prepared for four papers from this workshop. Author (CISTI)

N94-31740 Defence and Civil Inst. of Environmental Medicine, Toronto (Ontario). Environmental Physiology Section.
REVIEW OF PHARMACOLOGICAL APPROACH TO IMPROVE COLD TOLERANCE
A. L. VALLERAND and I. JACOBS *In its* Proceedings of the DCIEM Diver Thermal Protection Workshop p 119-123 Jan. 1992
Avail: Issuing Activity (Defence and Civil Inst. of Environmental Medicine, 1133 Sheppard Ave. W., P.O. Box 2000, North York, ON M3M 3B9 Canada)

It has been shown that beta-adrenergic drugs increase heat protection in humans exposed to comfortable ambient temperatures. The influence of a mixture of ephedrine and caffeine on cold tolerance was investigated in male subjects during 3-hour exposures to 10 C air. The drug ingestion reduced the total drop in core, mean skin, and mean body temperatures, thus producing significantly warmer final core, mean skin, and mean body temperatures compared to placebo ingestion. The drug ingestion increased the total 3-hour energy expenditure by 18.6 percent compared to that of the placebo ingestion in the cold. Using the non-protein respiratory exchange ratio to calculate the rates of substrate oxidation, it was found that the drug ingestion increased carbohydrate oxidation by 41.7 percent above that of the placebo, but did not alter lipid or protein metabolism. The results demonstrate that the ingestion of a mixture of ephedrine and caffeine improves cold tolerance in man by significantly increasing body temperatures in the cold. These improvements were caused by a greater energy expenditure, which appears to be dependent on an enhanced carbohydrate utilization. Author (CISTI)

N94-31741 Defence and Civil Inst. of Environmental Medicine, Toronto (Ontario). Environmental Physiology Section.
LIPID METABOLISM IN COLD-EXPOSED HUMANS
A. L. VALLERAND and I. JACOBS *In its* Proceedings of the DCIEM Diver Thermal Protection Workshop p 139-142 Jan. 1992
Avail: Issuing Activity (Defence and Civil Inst. of Environmental Medicine, 1133 Sheppard Ave. W., P.O. Box 2000, North York, ON M3M 3B9 Canada)

Changes in lipid utilization associated with cold exposure in humans was investigated along with the role of plasma triglyceride (TG) and lipolysis in lipid metabolism during cold exposure. Male subjects were subjected to an intravenous fat tolerance test (an index of plasma TG utilization) at thermal neutrality, in 10 C cold, and in the cold 24 hours after the first cold test. Rates of substrate oxidation were calculated from indirect calorimetry, and changes in plasma glycerol levels were measured as an index of lipolysis. Cold exposure reduced mean body temperature by 3.2 C and increased energy expenditure 2.6 times compared to warm values. Cold exposure also increased fat oxidation by 71 percent and plasma glycerol levels, but did not alter removal rates of the infused plasma TG. The second cold test was accompanied by a further increase in fat utilization and plasma glycerol levels, with unchanged fat tolerance. The results show that cold exposure in humans significantly increases the oxidation of lipid, and that plasma TG does not appear to be an important energy substrate in the cold. It is suggested that white adipose tissue and possibly intramuscular TG, not plasma TG, are the preferred sources of fatty acids for oxidation in cold-exposed humans. Author (CISTI)

N94-31742 Toronto Univ. (Ontario). Dept. of Physiology.
ERRORS ASSOCIATED WITH THE USE OF HEAT FLOW TRANSDUCERS
M. B. DUCHARME and J. FRIM *In* Defence and Civil Inst. of Environmental Medicine, Proceedings of the DCIEM Diver Thermal Protection Workshop p 213-221 Jan. 1992
Avail: Issuing Activity (Defence and Civil Inst. of Environmental Medicine, 1133 Sheppard Ave. W., P.O. Box 2000, North York, ON M3M 3B9 Canada)

Direct assessment of heat flux from the body is a basic measurement in thermal physiology. Heat flux transducers (HFTs) are increasingly being used for that purpose, but questions have been raised about the accuracy of the manufacturer's constant of calibration and the effect of the thermal resistance of the HFT on the true thermal flux from the skin. Two different types of waterproofed HFTs were checked for their calibration using the Rapid-K heat flow meter conductivity instrument. The mean difference between the recalibrations and the manufacturer's constants was +20.2 = or - 7.1 percent for Thermonetics HFTs and -0.7 = or - 4.8 percent for Concept Engineering HFTs. The significant difference in the calibration error between the two manufacturers becomes an important criterion for selecting HFTs. A model capable of simulating a large range of insulation values was used to study the effect of the underlying tissue insulation on the relative error in thermal flux due to the HFT thermal resistance. The data show that the deviation from the true value increases with the reciprocal of the underlying tissue insulation. The underestimation of heat flux through the skin measured by an HFT is minimum when the HFT is used on vasoconstricted skin in cool subjects, but becomes important when used on warm vasodilated subjects. Author (CISTI)

N94-31746 Colorado Univ., Boulder.
MUSCLE DISUSE THROUGH TAIL-SUSPENSION: ETIOLOGY AND THERAPEUTICS Ph.D. Thesis
ELLIS CALVIN GAYLES 1993 110 p
Avail: Univ. Microfilms Order No. DA9320424

Humans and animals experience a loss of muscle mass and size during exposure to the weightless environment of space. This effect is seen predominantly in the postural muscles of the leg. In order to more extensively study these effects, ground based models have been developed to mimic the effects of space flight on the mammalian musculoskeletal system. For rats or mice, the most common model involves suspending the animal by its tail such that the hind limbs are unloaded and the animal is tilted 30 degrees head down. The animal may only use its forelimbs for locomotion. In addition to unloading of the hind limbs, other physiological effects of suspension include anorexia, diuresis, and stress. The present research investigated the etiology of these suspension effects on mouse muscle mass and protein. Additionally, the sex and genotype dependence of these effects was also investigated. Two different therapeutic treatments were also developed to ameliorate the effects of suspension on the muscles. The results of the present studies estimate that unloading is responsible for approximately 50 percent of the suspension effect on muscle. Anorexia and stress are

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estimated to account for the other 50 percent. The effect of suspension on muscle mass was independent of sex or genotype; however the effect of suspension on muscle protein did demonstrate a genotype dependence. A resistance exercise regimen was developed to reduce the effects of suspension on the muscles. Suspended mice were required to walk on a grid with weight attached to their tails. This exercise regimen was performed daily during the suspension period. The daily exercise did not reduce the loss of muscle mass or muscle protein in the exercised mice. Pulsed electromagnetic fields (PEMF's) were also investigated as a method of muscle stimulation to reduce the effects of suspension. These fields had a positive effect on muscle mass and protein content. Suspended mice exposed to the PEMF's maintained more muscle mass than normal suspended mice. Additionally, mice exposed to the PEMF's averaged more muscle protein than non-field mice. These results suggest that PEMF's may provide an efficacious method for the alleviation of suspension effects on muscle.
Dissert. Abstr.

N94-31960 State Univ. of New York, Stony Brook.
ISOLATING STRAIN PARAMETERS CORRELATED TO SKELETAL ADAPTATION Ph.D. Thesis
TED S. GROSS 1993 176 p
Avail: Univ. Microfilms Order No. DA9328176

The close association between skeletal morphology and parameters such as strain magnitude, strain rate, and strain energy density suggest that the cellular populations of bone perceive and respond to mechanically induced deformations within the tissue. However, the specific stimulus responsible for the control and maintenance of skeletal tissue has yet to be defined. In this study, we develop an in vivo model of skeletal adaptation, assess whether physical stimuli are necessary to maintain bone mass in the adult skeleton, isolate mechanical parameters correlated to sites of adaptation induced by an exogenous loading regimen, and lastly validate these relationships by their ability to predict adaptation in the same model under alternate loading conditions. The right radii of three groups of five adult male turkeys were functionally isolated via parallel metaphyseal osteotomies. The left radius served as an intact, contra-lateral control. The first group of animals remained unloaded for a period of eight weeks. The remaining two groups were exposed to a four week exogenous loading regimen placing the bone primarily in bending. The groups were identical except for the orientation of the transcutaneous loading pins, which were rotated 90 degrees in the transverse plane in the last group of animals (group 'B'). Using multiple step-backward regression, adaptive responses were related to candidate mechanical parameters defined by orthotropic finite element models whose geometry was based upon each animal's intact control radius. Eight weeks of disuse induced a mean (+/- S.D.) 12.1 +/- 7.1 percent reduction of bone mass. The loss was achieved primarily via uniform endosteal expansion suggesting that the entire cortex is sensitive to mechanical stimuli. The exogenous loading regimen induced a 20.4 +/- 28.8 percent increase in bone area in group 'A', and a 35.2 +/- 32.8 percent increase in group 'B', primarily via periosteal expansion. In both groups, the location of greatest periosteal expansion corresponded with sites of minimum rather than maximum strain magnitudes. Of the many candidate correlates, only the surface epsilon(sub zz) gradient in the circumferential direction was validated by its ability to predict adaptation in the alternate loading group. The predictive power of this parameter is particularly intriguing when considering possible physiologic mechanisms of cellular signal transduction such as streaming potentials and cellular communication via gap junctions. Dissert. Abstr.

N94-32156# Naval Air Warfare Center, Warminster, PA. Aircraft Div.
VALIDATION AND SENSITIVITY ANALYSIS OF TEXAS HUMAN THERMAL MODEL PREDICTIONS DURING COLD WATER IMMERSION Final Report, Mar. - Sep. 1992
BARRY S. SHENDER and JONATHAN W. KAUFMAN 1 Feb. 1993 153 p
(AD-A275240; NAWCADWAR-93069-60) Avail: CASI HC A08/MF A02

The Texas Human Thermal Model has been used to simulate the effects of thermal stresses on individuals under a variety of conditions. As part of a U.S. Navy effort to develop integrated protection garments, the Model has been modified to predict tolerance to cold water immersion with garments whose CLO values are less than 0.1. Other program modifications have been implemented leading to easier use, enhanced speed and versatility and accuracy of predictions. With these modifications, a validation of Model performance was done using human data obtained from Finnish cold water immersion suit assessments. Limitations in Model performance were found but predictions of rectal temperature (T(sub re)) were in reasonable agreement to actual results. A sensitivity analysis was also performed to determine which Model parameters were most effected by cold water immersions. The condition tested was head-out immersion in 40 deg F water by 160 lb man with a 10 mm mean skinfold thickness. Based on the thermal end points, the Model was sensitive to body segmental changes in CLO (ordered from most to least sensitive): chest and abdomen, leg, head, arm, foot, and hand. Mean skinfold thickness, basal metabolic rate, body weight and level of exercise metabolic rate up to 100 BTU/hr were the most important physical parameters affecting Model performance. Lowering the water temperatures to 28 deg F caused a simple shift by in segment temperature predictions with respect to 40 deg F estimates. The overall shapes of the curves at 28 and 40 deg F were essentially the same, though the 28 deg F curves had steeper slopes leading to a faster fall to critical temperatures. DTIC

N94-32347* National Aeronautics and Space Administration, Washington, DC.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 389)
Jun. 1994 98 p
(NASA-SP-7011(389); NAS 1.21:7011(389)) Avail: CASI HC A05

This bibliography lists 234 reports, articles, and other documents recently introduced into the NASA Scientific and Technical Information System. Subject coverage includes: aerospace medicine and physiology, life support systems and man/system technology, protective clothing, exobiology and extraterrestrial life, planetary biology, and flight crew behavior and performance. Author

N94-32348* National Aeronautics and Space Administration, Washington, DC.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 385)
Feb. 1994 168 p
(NASA-SP-7011(385); NAS 1.21:7011(385)) Avail: CASI HC A08

This bibliography lists 536 reports, articles and other documents introduced into the NASA Scientific and Technical Information System Database. Subject coverage includes: aerospace medicine and physiology, life support systems and man/system technology, protective clothing, exobiology and extraterrestrial life, planetary biology, and flight crew behavior and performance.
Author

N94-32471*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
VIRTUAL REALITY IN MEDICAL EDUCATION AND ASSESSMENT
LAURIE A. SPRAGUE (LinCom Corp., Houston, TX.), BRAD BELL (LinCom Corp., Houston, TX.), TIM SULLIVAN (LinCom Corp., Houston, TX.), MARK VOSS (LinCom Corp., Houston, TX.), ANDREW F. PAYER (Texas Univ., Galveston.), and STEWART MICHAEL GOZA *In* NASA, Washington, Technology 2003: The Fourth National Technology Transfer Conference and Exposition, Volume 2 p 439-443 Feb. 1994

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Avail: CASI HC A01/MF A04

The NASA Johnson Space Center (JSC)/LinCom Corporation, the University of Texas Medical Branch at Galveston (UTMB), and the Galveston Independent School District (GISD) have teamed up to develop a virtual visual environment display (VIVED) that provides a unique educational experience using virtual reality (VR) technologies. The VIVED end product will be a self-contained educational experience allowing students a new method of learning as they interact with the subject matter through VR. This type of interface is intuitive and utilizes spatial and psychomotor abilities which are now constrained or reduced by the current two dimensional terminals and keyboards. The perpetual challenge to educators remains the identification and development of methodologies which conform the learners abilities and preferences. The unique aspects of VR provide an opportunity to explore a new educational experience. Endowing medical students with an understanding of the human body poses some difficulty challenges. One of the most difficult is to convey the three dimensional nature of anatomical structures. The ideal environment for addressing this problem would be one that allows students to become small enough to enter the body and travel through it - much like a person walks through a building. By using VR technology, this effect can be achieved; when VR is combined with multimedia technologies, the effect can be spectacular. Author (revised)

N94-32623 David Sarnoff Research Center, Princeton, NJ.

MODELS OF THE NEURONAL MECHANISMS OF TARGET LOCALIZATION OF THE BARN OWL Final Report, 11 Sep. 1990 - 20 Sep. 1993

JOHN PEARSON Nov. 1993 24 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Contract F49620-89-C-0131)

(AD-A277332; AFOSR-94-0061) Avail: CASI HC A03

Models of the computation of sound direction in the brainstem and midbrain of the barn owl (tyto alba) were developed. Nucleus laminaris is the first site of interaural time-delay (ITD) processing. It was shown that standard neuron models would have to have unrealistically fast time constants in order to match the 10 microsecond ITD resolution characteristic of laminaris neurons. Three physiological reasonable, qualitatively distinct alternatives, were developed. Nucleus ventralis lemnisci lateralis pars posterior (VLVp) and the lateral shell of the central nucleus of the inferior colliculus (ICL) are the first two stages of interaural level differences (ILD) processing. It was shown how a thermometer code of ILD could be formed in VLVp through competitive dynamics, and how the ILD-tuned responses of ICL neurons could derive from the VLVp through lateral inhibition. It was shown how this architecture could be modified to achieve near independence from the average binaural level. Experimentalists are now checking the predictions of these models of ILD and ITD processing. DTIC

N94-32732# Los Alamos National Lab., NM. Laser Sciences and Applications Group.

NONINVASIVE SPECTROSCOPIC DIAGNOSIS OF SUPERFICIAL OCULAR LESIONS AND CORNEAL INFECTIONS

J. R. MOURANT, I. J. BIGIO, T. JOHNSON, T. SHIMADA, D. C. GRITZ, and K. STOREY-HELD 1994 10 p Presented at the OE/LASE 1994 Conference on Optics, Electro-Optics, and Laser Applications in Science and Engineering, Los Angeles, CA, 22-29 Jan. 1994

(Contract W-7405-ENG-36)

(DE94-006231; LA-UR-94-16; CONF-940142-8) Avail: CASI HC A02/MF A01

The potential of a rapid noninvasive diagnostic system to detect tissue abnormalities on the surface of the eye has been investigated. The optical scatter signal from lesions and normal areas on the conjunctival sclera of the human eye were measured in vivo. It is possible to distinguish nonpigmented pingueculas from other lesions. The ability of the system to detect malignancies could not be tested because none of the measured and biopsied lesions were malignant. Optical scatter and fluorescence spectra of bacterial and fungal suspensions, and corneal irritations were also collected. Both scattering and fluorescence show potential for diagnosing corneal infections. DOE

N94-33040# Army Research Inst. of Environmental Medicine, Natick, MA.

NUMERICAL MODEL OF THE THERMAL BEHAVIOR OF AN EXTREMITY IN A COLD ENVIRONMENT INCLUDING COUNTER-CURRENT HEAT EXCHANGE BETWEEN THE BLOOD VESSELS

AVRAHAM SHITZER, LEANDER A. STROSCHEIN, PAUL VITAL, RICHARD R. GONZALES, and KENT B. PANDOLF Mar. 1994 122 p

(AD-A279099; USARIEM-T94-10) Avail: CASI HC A06/MF A02

A numerical model of the thermal behavior of an extremity, e.g., finger, is presented. The model includes the effects of: (1) heat conduction, (2) metabolic heat generation, (3) heat transport by blood perfusion, (4) heat exchange between the tissue and the large blood vessels, and (5) arterio-venous heat exchange. Heat exchange with the environment through a layer of thermal insulation, depicted by thermal handwear is also considered. The tissue is subdivided into four concentric layers. The layers described, from the center outward, as core, muscle, fat, and skin. Differential heat balance equations are formulated for the tissue and the major artery and the major vein. These coupled equations are solved numerically by the alternating direction method employing a Thomas algorithm. The numerical scheme was tested extensively for stability and convergence. Results of the convergence tests are presented and discussed and the dependence on the number of grid points is demonstrated. Plots of tissue and blood temperatures along selected nodes of the model are shown for different combinations of parameters. The effect of counter-current heat exchange between the artery and the vein on the thermal balance of the extremity is presented. This shows clearly the conservation of energy achieved due to this mechanism. The report is concluded by considering the effects of cold induced vasodilation on tissue temperature cycling. DTIC

N94-33069 Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Images.

FAST NONSUPERVISED 3D REGISTRATION OF PET AND MR IMAGES OF THE BRAIN

JEAN-FRANCOIS MANGIN (Commissariat a l'Energie Atomique, Orsay, France.), VINCENT FROUIN (Commissariat a l'Energie Atomique, Orsay, France.), ISABELLE BLOCH, BERNARD BENDRIEM, and JAIME LOPEZ-KRAHE 1993 46 p Submitted for publication Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(ISSN 0751-1337)

(TELECOM-93-C-006; ETN-94-95979) Avail: CASI HC A03

A fully nonsupervised methodology dedicated to the fast registration of PET (Positron Emission Tomography) and MR (Magnetic Resonance) images of the brain is proposed. Discrete representations of the surfaces of interest (head or brain surface) are automatically extracted form both images. A shape independent surface matching algorithm yields a rigid body transformation, which allows the transfer of information between both modalities. A 3D (three dimensional) extension of the chamfer matching principle makes up the core of this surface matching algorithm. The optimal transformation is inferred from the minimization of a quadrative generalized distance between discrete surfaces, taking into account between modalities differences in the localization of the segmented surfaces. The minimization process is efficiently performed via the precomputation of a 3D distance map. Validation studies using a dedicated brain shaped phantom showed that the maximum registration error was of the order of the PET pixel size (2 mm) for the wide variety of tested configurations. The software is routinely used in a clinical context by physicians (more than 50 registrations per-

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formed). The entire registration process requires about five minutes on a conventional workstation. ESA

N94-33092 Massachusetts General Hospital, Boston. Labs. of Photomedicine.
DEVELOPMENT OF A VIDEO FLUORESCENCE SYSTEM FOR ASSESSING BURN DEPTH Final Report, 26 May 1992 - 25 Dec. 1993
JOHN A. PARRISH, NORMAN S. NISHIOKA, MAYA JERATH, DOMINIC BUA, and GEOFFREY SILVER 14 Jan. 1994 24 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract DAMD17-92-J-2019; DA PROJ. 3M2-63004-D-805)
(AD-A278127) Avail: CASI HC A03

The ultimate objective of our research is to develop an integrated laser-based system for treating burn injury. The first phase of this development effort was funded under the present contract. The objective was to design, construct and optimize a diagnostic system suitable for clinical use in humans that accurately determines burn depth. The diagnostic system utilizes an exogenously administered fluorescent dye to label skin vasculature that is detected by a fluorescence imaging system. During the past year the design criteria for such a system were formulated, the components acquired and the system constructed. A series of experiments have been carried out in animals to test and optimize the system. We have demonstrated that the ratio of fluorescence intensity detected by the system at a burn site to that detected from normal skin, can be used to accurately determine the extent of burn injury. The burn diagnostic system is now ready for clinical deployment to gather further data and refine the system. DTIC

N94-33268 Army Research Inst. of Environmental Medicine, Natick, MA.
MEDICAL PROBLEMS IN HIGH MOUNTAIN ENVIRONMENTS. A HANDBOOK FOR MEDICAL OFFICERS Final Report
ALLEN CYMERMAN and PAUL B. ROCK Feb. 1994 64 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A278095; USARIEM-TN94-2) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

This Technical Note describes the physiological and medical basis for the prevention and treatment of altitude-related illnesses and a description of the reduced mental and physical performance incurred by troops in an operational high terrestrial altitude environment. Medical officers are provided with background information for the diagnosis, prevention, and management of the primary altitude-induced medical problems: acute mountain sickness (AMS), high altitude pulmonary edema (HAPE), and high altitude cerebral edema (HACE). Secondary medical problems are also reviewed as are precautionary and contributory sea-level medical conditions and general physiological and psychological factors affecting the performance of soldiers at altitude. DTIC

53
BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N94-31440# Maryland Univ., Baltimore. School of Medicine.
DEVELOPMENT AND ENHANCEMENT OF A MODEL OF PERFORMANCE AND DECISION MAKING UNDER STRESS IN A REAL LIFE SETTING Quarterly Report No. 11, 1 Nov. 1993 - 31 Jan. 1994
COLIN F. MACKENZIE 9 Feb. 1994 18 p
(Contract N00014-91-J-1540)
(AD-A276029) Avail: CASI HC A03/MF A01

A large portion of the quarter has been taken up with video-analysis and administrative requirements for reapproval of the protocol by the Institutional Review Board. A few additional cases have been videotaped in conjunction with Holter monitoring and blood pressure (BP) recording of the anesthesia care providers. DTIC

N94-31990 Massachusetts Inst. of Tech., Cambridge.
MODEL-BASED SCIENTIFIC DISCOVERY: A STUDY IN SPACE BIOENGINEERING Ph.D. Thesis
NICOLAS GROLEAU 1992
Avail: Issuing Activity (MIT Libraries, Rm. 14-0551, Cambridge, MA 02139-4307)

This thesis describes a novel system that modifies the theory contained in a model of the normal human orientation system. This system, called MARIKA, demonstrates automated scientific discovery in an actual scientific domain through techniques adapted from diagnosis and design. MARIKA comprises a simulation module, a constraint propagation module and a model revision module. The module is captured in a simulation environment that produces time-varying signals. The model parameters are represented as constrained range variables and the input, output and intermediary signals are segmented in time and approximated by linear combinations of a set of four simple shape adequate for the vestibular domain. The model linear differential equations and boundary conditions are transformed into constraints on the curve fit parameters and the model parameters. Some extensions are also provided to cover simple non-linear cases and steady state conditions. Clinical data are abstracted using the shapes predicted by the model. These data are then compared to simulation predictions by propagating the constraints relating the model and the curve fit parameters. In case of contradiction, the model is modified by either extending the range of model parameters to pathological values or altering the structure of the model according to pre-indexed methods. MARIKA correctly models normal vestibular data and several end organ and nervous processing defects. MARIKA demonstrates the synergy of diagnosis and design techniques, qualitative and quantitative representation, and modeling, simulation, and artificial intelligence for a routine form of automated scientific discovery. MARIKA's set of shapes could readily be enhanced to be used to perform model-based theory refinement on a variety of linear domains. These encouraging results could lead to a useful clinical vestibular tool and to a space vestibular adaptation scientific discovery system. Dissert. Abstr.

N94-32035 Aerospace Medical Research Labs., Brooks AFB, TX. Aerospace Medicine Directorate.
ANALYSIS OF PURSUIT TRACKING EYE MOVEMENTS IN PILOTS AND NONFLIERS Final Report, 1 Jan. 1993 - 1 Jan. 1994
EDWARD J. ENGELKEN, KENNITH W. STEVENS, ANN F. BELL, and JACK D. ENDERLE 1 Jan. 1994 7 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract AF PROJ. ILIR; AF PROJ. 7755)
(AD-A276597; AL/AO-PC-1994-0003) Avail: CASI HC A02

Pursuit tracking eye movements were recorded and analyzed from a group of Air Force pilots and a group of nonflying Air Force Members. The tracking performance of the pilots was compared to the performance of the nonfliers. Subjects tracked a small spot of light moving sinusoidally in the horizontal plane at frequencies ranging from 0.2 to 1.0 Hz while their eye movements were recorded. An adaptive nonlinear digital filter was used to separate the total tracking response (TTR) into smooth pursuit (SP) and saccadic (SA) components. There were no significant differences in tracking performance between pilots and nonfliers. DTIC

N94-32096 Loyola Univ., Chicago, IL. Hearing Inst.
DETERMINATION OF MULTIPLE SOUND SOURCES Annual Report, 1 Sep. 1992 - 1 Sep. 1993
WILLIAM A. YOST, STANLEY SHEFT, and RAYMOND DYE 1 Oct. 1993 16 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

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(Contract F49620-92-J-0489)
(AD-A277379; AFOSR-94-0127TR) Avail: CASI HC A03

We have completed the final construction of the sound-deaden listening room and the digital library of stored words, numbers, and letters, from nine English speaking males. We conducted pilot experiments on 20 subjects listening to one and two sound sources at a time. The results of the pilot experiments indicated that the sound room was well calibrated and allowed us to determine that a few of the words, letters, and numbers should be recorded. In addition the pilot experiment suggested a few modifications to our protocol. The new utterances have been recorded, the protocol modifications made, and a new set of 10 subjects were tested. The results from this additional set indicated that we had a good listening room, set of utterances, and procedure. From October until January of 1993 we will test the headphone listening protocol making adjustments where necessary. We plan to collect data in the full experiment starting late January 1994. DTIC

N94-32187# Naval Aerospace Medical Research Lab., Pensacola, FL.
EFFECTS OF METHAMPHETAMINE AND FATIGUE ON LONG- AND SHORT-TERM MEMORY Interim Report, 1993
R. R. STANNY, A. H. MCCARDIE, and D. F. NERI Nov. 1993 27 p
(AD-A276452; NAMRL-1387) Avail: CASI HC A03/MF A01

We examined the effects of a 10 mg/70 kg oral dose of d-methamphetamine HCl on fatigue-related deficits of short- and long-term memory. We used a recognition memory-search task with two memory loads. In one experimental condition, stimuli were committed to long-term memory (LTM) and performance was rendered automatic by extensive practice with consistently mapped stimuli and responses. In a second condition, the task was organized so that recognition depended on short-term memory (STM) despite equally extensive practice. After 7680 training trials, 13 subjects performed the task at 90-min intervals in a 13.5-h, sustained-performance session that began at 1930 and ended at 0900. At 0116, seven subjects were administered capsules containing 10 mg/70-kg body weight d-methamphetamine HCl, double-blind. The remaining subjects were administered a placebo. Memory-trace strengths and decision speeds declined during the early part of the night in all experimental conditions. The methamphetamine treatment reversed these effects within approximately 2 h of administration. The methamphetamine treatment also reversed an increasing trend in lapse probabilities. The stimulant did not merely produce criterion shifts that led subjects to respond impulsively (more rapidly but less accurately). These results suggest that the methamphetamine treatment produced genuine increases in accuracy of recognition and that any criterion shifts that may have occurred were more than compensated for by increased accuracy. DTIC

N94-32276 York Univ. (Ontario).
SENSORY SENSITIVITIES AND DISCRIMINATIONS AND THEIR ROLES IN AVIATION Final Report, 1 Nov. 1990 - 31 Oct. 1993
DAVID M. REGAN 30 Nov. 1993 137 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract AF-AFOSR-0080-91)
(AD-A277312; AFOSR-94-0078TR) Avail: CASI HC A07

Evidence that intersubject differences in the ability to process motion-defined (MD) shape are not predicted by the ability to process luminance-defined (LD) shape, that motion is processed by hierarchical manner, that discrimination and detection can be dissociated for MD form, and that spatial discrimination for MD and LD form are not entirely mediated by the same mechanism is as follows. Reducing presentation duration or dot lifetime from 1.0 to 0.1 sec progressively reduced the visibility of a MD bar, but did not reduce orientation discrimination for the bar when visibility was held constant. Detection and/or recognition of MD letters can be degraded by removal of brain tissue underlying prestriate cortex without affecting contrast sensitivity, Snellen acuity, low contrast acuity, or sensitivity to motion. Shape discrimination for an MD rectangle can be as low as 2 to 3 percent, as good as for an LD rectangle. Evidence is reported for a neural mechanism sensitive to shape independently of size. Evidence is reported for a neural mechanism directly sensitive to time to collision with an approaching object. A method is reported for measuring intersubject differences in discrimination of time to contact. A titration method for uncovering the color-defined form system is reported. The 40 Hz human brain response indexes magnocellular activity. By recording the magnetic field of the brain, an audio-visual integration area in the brain has been identified. Responses to texture-defined form and color-defined form have been unconfounded from responses to luminance-defined form. A technique for measuring intersubject differences in susceptibility to glare has been developed and is being used in a prospective study of flying safety. Also, the test quantifies visual status in cataract patients. DTIC

N94-32277 Carnegie-Mellon Univ., Pittsburgh, PA.
A DIFFERENTIAL THEORY OF LEARNING FOR EFFICIENT STATISTICAL PATTERN RECOGNITION Final Report, 30 Sep. 1989 - 29 Sep. 1993
JOHN HAMPSHIRE and B. V. KUMAR 15 Dec. 1993 445 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract AF-AFOSR-0551-89)
(AD-A277313; AFOSR-94-0073TR) Avail: CASI HC A19

Probabilistic learning strategies currently use are inefficient, requiring high classifier complexity and large training samples. In this report, we introduce and analyze an asymptotically efficient differential learning strategy. It guarantees the best generalization allowed by the chosen classifier paradigm. Differential learning also requires the classifier with minimal complexity. The theory is demonstrated in several real-world machine learning/pattern recognition tasks. DTIC

N94-32344 North Carolina Univ., Chapel Hill. Dept. of Computer Science.
VISUAL ENCODING OF SPATIAL RELATIONS Annual Report, 1 Jan. - 31 Dec. 1993
CHRISTINA A. BURBECK 26 Jan. 1994 11 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F49620-92-J-0114)
(AD-A277400; AFOSR-94-0115TR) Avail: CASI HC A03

Psychophysical and theoretical research was conducted on the processes underlying the encoding of relative spatial locations of objects and edges of single objects. Work was done on developing a model of shape representation, called Object Representation by Cores, that is based on previous findings, sponsored by this grant, that the area over which position information is gathered scales with the distance being judged. Experimental work included measuring orientation discrimination thresholds for cone stimuli of various widths and measuring bisection thresholds for stimuli with sinusoidally modulated edges, where both edge modulation frequency and object width were manipulated. Results of both studies verified the key assumption of the model: the scale of the boundariness detector that contributes to perception of object shape covaries with object width. Studies continued on the perception of area. A new line of research was begun on the nature of information observers have about scenes containing multiple objects. DTIC

N94-32345# New York Univ., New York.
VISUAL NEURAL DEVELOPMENT AND CHROMATIC ABERRATION Annual Report, 15 Mar. 1992 - 14 Mar. 1993
LAURENCE T. MALONEY 14 Mar. 1993 5 p
(Contract F49620-92-J-0187)
(AD-A277402; AFOSR-94-0109TR) Avail: CASI HC A01/MF A01

The purpose of the research is to (1) develop and test new methods to study the internal visual representation of the shape and surface properties of objects, and the mechanisms that calibrate it;

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(2) use the methods to investigate the representation of contour, shape and surface properties; (3) use the methods to study the representation of visual space; and (4) study visual (re-)calibration mechanisms. DTIC

N94-32419 Connecticut Univ., Storrs. Dept. of Communication Sciences.
AUDITORY PERCEPTION Annual Report, 1 Jan. - 31 Dec. 1993
MARION F. COHEN 23 May 1994 7 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F49620-93-1-0070)
(AD-A277414; AFOSR-94-0105TR) Avail: CASI HC A02

The experiments described in this report were designed to study the effects of certain acoustic cues on detectability of a delayed signal. The purpose was to gain insight into how the ear suppresses multiple hearings in a reverberant setting. Results of the experiments indicate that a signal, intended to simulate and echo, is more difficult to detect when it is following an identical masker, intended to simulate a primary sound, than when it is leading that masker. If, however, the signal is not acoustically similar to the masker, this asymmetry disappears, even if the masker is equally effective in the simultaneous condition. Further, if the signal and masker are not identical, but share an important acoustic attribute such as harmonicity, the asymmetry is observed. In summary, detectability of the delayed signal seems to be dependent on the strength of acoustic connection between the signal and masker, whereas detectability of the leading signal does not demonstrate that dependence. DTIC

N94-32472*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
TECHNOLOGY TRANSFER OF OPERATOR-IN-THE-LOOP SIMULATION
K. H. YAE (Iowa Univ., Iowa City.), H. C. LIN (Iowa Univ., Iowa City.), T. C. LIN (Iowa Univ., Iowa City.), and H. P. FRISCH In NASA, Washington, Technology 2003: The Fourth National Technology Transfer Conference and Exposition, Volume 2 p 444-455 Feb. 1994
Avail: CASI HC A03/MF A04

The technology developed for operator-in-the-loop simulation in space teleoperation has been applied to Caterpillar's backhoe, wheel loader, and off-highway truck. On an SGI workstation, the simulation integrates computer modeling of kinematics and dynamics, real-time computational and visualization, and an interface with the operator through the operator's console. The console is interfaced with the workstation through an IBM-PC in which the operator's commands were digitized and sent through an RS-232 serial port. The simulation gave visual feedback adequate for the operator in the loop, with the camera's field of vision projected on a large screen in multiple view windows. The view control can emulate either stationary or moving cameras. This simulator created an innovative engineering design environment by integrating computer software and hardware with the human operator's interactions. The backhoe simulation has been adopted by Caterpillar in building a virtual reality tool for backhoe design. Author

N94-32495 Illinois Univ., Urbana-Champaign.
INFORMATION THEORY FOR ARM VISUO-MOTOR COORDINATION Ph.D. Thesis
TARCISIO PASSOS RIBE DECAMPOS 1993 166 p
Avail: Univ. Microfilms Order No. DA9328987

The present work addresses the information processing of visuo-motor coordination. The aim of this research is to develop an adaptive model for coordinating mechanical action of an arm according to visual information. As a result, a large neural map has been generated which has been used to guide a pneumatically driven robot arm through a vision system consisting of image boards and two stereo cameras. This engineering approach has been employed to test the algorithm which might share close features with the way that biological beings solve the same sensory-motor task. Basically, arm postures are represented through their projections onto a set of image planes. Based on the link orientations and lengths as visual primitives extracted from these images, a topological state-space is characterized. Arm kinematics is defined as transformations of topological hypersurfaces, the intersections of which represent all possible postures which any redundant arm possesses in reaching an arbitrary target position. The self-organizing feature map has learned how the topological hypersurfaces transform in the state-space during arbitrary movements of the arm. The analyses of these transformations helped in idealizing a connectionistic model for kinematics. A model for the collision-free motion of a redundant arm manipulator moving in a workspace with obstacles is presented. A mapping of the arm surface onto a set of lattices, in which visual, motor information, and surface location are encoded, is adaptively developed through a learning procedure fed by trial movements. The map, which carries topographical features of the arm surface, is then used to guide the arm avoiding collisions with obstacles in unpredictable positions. The main achievements of this research are the topographical neural model for obstacle-avoidance and the connectionist model for kinematics for redundant arms. Both models have been developed based on the analyses of a dynamic geometry, induced by the arm movements, embedded in a denoted visuo-motor space. The topographical neural model presents similar features with the motor cortex which might provide some insight for understanding biological visuo-motor control. Dissert. Abstr.

N94-32577# Florida Univ., Gainesville. Dept. of Psychology.
MECHANISMS OF TEMPORAL PATTERN DISCRIMINATION BY HUMAN OBSERVERS Final Technical Report, 1 Oct. 1990 - 31 Dec. 1993
ROBERT D. SORKIN 15 Feb. 1994 157 p
(Contract AF-AFOSR-0065-91)
(AD-A277407; AFOSR-94-0129TR) Avail: CASI HC A08/MF A02

The project's first component studied how human listeners discriminate two temporal patterns of tones. The stimuli were non-speech, non-musical tone sequences that conveyed arhythmic or partly rhythmic time patterns. The results indicated that the temporal pattern discrimination process depends on the timing of the sequences and whether they overlap in time. Listeners can perform the task very well when the patterns do not overlap and are presented to separate ears and/or at different tone frequencies. At long time separations, the listener's discrimination mechanism reduces the input information to two lists of intertone times, and the decision is based on the correlation between the lists (a temporal correlation process). At short time separations, the mechanism computes statistics based on the summed envelope of the two input waveforms (a single channel process). The project's second component consisted of analytical and computer modeling of multi-element detection systems. New results were obtained on the performance of statistically optimal detector arrays and on arrays that combine their binary outputs. The project's third component studied how observers process information in multi-element, visual signal detection. The results describe how performance depends on display element reliability, coding, and arrangement. DTIC

N94-32956# Northwestern Univ., Evanston, IL.
READING: INTERACTION WITH MEMORY Final Report, 1 Mar. 1990 - 31 Aug. 1993
GAIL MCKOON 15 Dec. 1993 170 p
(Contract AF-AFOSR-0246-90)
(AD-A277547; AFOSR-94-0097TR) Avail: CASI HC A08/MF A02

The topic of the supported research was reading and the ways information in memory can contribute to the inference processes that occur during reading. One source of information for inference processes is short-term memory for parts of a text that have already been read. Experiments investigated how this information is made available to allow, for example, inferences that decide the correct referent of a pronoun, or inferences that relate via causality two events described by the text. Experiments also examined the local

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representation constructed for a text, testing our proposal that locally available information is structured by the linguistic, semantic, and pragmatic means by which the information is expressed. A second line of research examined interactions between inference processes and well-known information from long-term memory, examining knowledge of the semantic structures of verbs, knowledge of what concepts are frequently associated with each other, and knowledge about how lexical items are used in various contexts. DTIC

N94-32997# Illinois Univ., Urbana. Dept. of Psychology.
REMINDING-BASED LEARNING Annual Technical Report, 21 Jan. 1993 - 20 Jan. 1994
BRIAN H. ROSS 8 Feb. 1994 12 p
(Contract AF-AFOSR-0447-89)
(AD-A277424; AFOSR-94-0126TR) Avail: CASI HC A03/MF A01

When learning new cognitive skills involving problem solving, novices are often reminded of earlier problems. The use of earlier problems is a common means of problem solving and affects the learning of the skill. This project has three aims in understanding this learning. First, the representation of the resulting generalizations is being examined. Generalizations formed from remindings are likely to be conservative, in that they may be more tied to the examples than many current theories allow. A main aim of the project is to distinguish and test different forms of this conservatism. Second, the development of problem solving expertise is examined by focusing on differences in how typical and atypical problems are solved. Third, the effects of such reminding-based learning in everyday problem solving is examined to extend the findings and test some theoretical ideas that are difficult to investigate in more formal domains. This report provides an overview of this work and the progress on these objectives during the last year. DTIC

N94-32998# Smith-Kettlewell Inst. of Visual Sciences, San Francisco, CA. Eye Research.
VISUAL PROCESSING OF OBJECT VELOCITY AND ACCELERATION Annual Technical Report, 16 Jan. 1993 - 15 Jan. 1994
SUZANNE MCKEE 4 Feb. 1994 3 p
(Contract F49620-92-J-0156)
(AD-A277425; AFOSR-94-0102TR) Avail: CASI HC A01/MF A01

Human observers can easily detect a signal dot moving, in apparent motion, on a trajectory embedded in a background of random-direction motion noise. A high detection rate is possible even though the spatial and temporal characteristics (step size and frame rate) of the signal are identical to the noise, making the signal indistinguishable from the noise on the basis of a single pair of frames. The success rate for detecting the signal dot was as high as 90% when the probability of mismatch from frame-to-frame, based on nearest neighbor matching was 0.3, control experiments showed that trajectory detection is not based on detecting a 'string' of collinear dots, i.e., a stationary position cue. Nor is a trajectory detected because produces stronger signals in independent 'local' motion detectors. For one thing, trajectory detection improves with increases in duration, up to 250-400 msec, a duration longer than the integration typically associated with a single motion detector. Moreover, the signal dot need not travel in a straight line to be detectable. The signal dot was as reliably detected when it changed its direction a small amount (less than 30 deg) each frame. Consistent with this, circular paths of sufficiently low curvature were as detectable as straight trajectories. DTIC

N94-33053 Draper (Charles Stark) Lab., Inc., Cambridge, MA.
INVESTIGATION OF DRIVE-REINFORCEMENT LEARNING AND APPLICATION OF LEARNING TO FLIGHT CONTROL Final Report, 1 Jan. 1989 - 1 Aug. 1993
WALTER L. BAKER, STEPHEN C. ATKINS, LEEMON C. BAIRD, III, MARK A. KOENIG, and PETER J. MILLINGTON Aug. 1993 503 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F33615-88-C-1740)
(AD-A277442; CSDL-R-2575; WL-TR-93-1153) Avail: CASI HC A22

This report describes results obtained during a multiphase research program having the broad aim of investigating the application of learning systems to automatic control in general and to flight control in particular. The first phase analyzed the drive-reinforcement learning paradigm and examined its application to automatic control, with mixed results. The second phase compared a number of alternative strategies for learning augmented control and resulted in the conception of a new hybrid adaptive/learning control scheme. Subsequently, in the third phase, this hybrid control approach was more fully developed and applied to several nonlinear dynamical systems, including a cart-pole system, aeroelastic oscillator, and a three degree of freedom aircraft. The fourth phase revisited drive-reinforcement learning from the point of view of optimal control and successfully applied a version embedded in the associative control process architecture to regulate an aeroelastic oscillator. The fifth phase examined the problem of learning augmented estimation and resulted in the development of a preliminary estimation scheme consistent with the hybrid control approach. In the sixth and final phase, the hybrid control methodology was applied to a nonlinear, six degree of freedom flight control problem and then demonstrated via a challenging multiaxis maneuver. DTIC

N94-33068*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
AUTOGENIC-FEEDBACK TRAINING AS A TREATMENT FOR AIRSICKNESS IN HIGH-PERFORMANCE MILITARY AIRCRAFT: TWO CASE STUDIES
PATRICIA S. COWINGS, WILLIAM B. TOSCANO, NEAL E. MILLER, and SAMUEL REYNOSO Mar. 1994 22 p
(Contract RTOP 199-70-12-14)
(NASA-TM-108810; A-94048; NAS 1.15:108810) Avail: CASI HC A03/MF A01

The purpose of this paper is to present a detailed description of the physiological and performance responses of two military pilots undergoing a treatment for motion sickness. The treatment used, Autogenic-Feedback Training (AFT), is an operant conditioning procedure where subjects are taught to control several of their autonomic responses and thereby suppress their motion sickness symptoms. Two male, active duty military pilots (U.S. Navy and U. S. Marine Corps), ages 30 and 35, were each given twelve 30-minute training sessions. The primary criterion for success of training was the subject's ability to tolerate rotating chair motion sickness tests for progressively longer periods of time and at higher rotational velocities. A standardized diagnostic scale was used during motion sickness to assess changes in the subject's perceived malaise. Physiological data were obtained from one pilot during tactical maneuvers in an F-18 aircraft after completion of his training. A significant increase in tolerance to laboratory-induced motion sickness tests and a reduction in autonomic nervous system (ANS) response variability was observed for both subjects after training. Both pilots were successful in applying AFT for controlling their airsickness during subsequent qualification tests on F-18 and T-38 aircraft and were returned to active duty flight status. Author

N94-33241 Hawaii Univ., Honolulu. Dept. of Psychology.
FROM ANIMALS TO ANIMATS Final Report, 30 Sep. 1992 - 29 Sep. 1993
HERBERT L. ROITBLAT 29 Sep. 1993 9 p The Second International Conference on the Simulation of Adaptive Behavior was held in Hololulu, HI, 7-11 Dec. 1992 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F49620-92-J-0530)
(AD-A277427; AFOSR-94-0071TR) Avail: CASI HC A02

This project provided partial support for an international conference on the simulation of adaptive behavior. The conference was held in Honolulu, HI on December 7-11, 1992. It was attended by more than 100 scientists from the US, Europe, and Asia. The main topic of the conference was how to use theories of animal behavior

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as a guide in the construction of robots and other autonomous agents. Contributors discussed how to develop behavior-based artificial intelligence, perception and motor control, action selection and the structuring of behavioral sequences, cognitive maps and internal world models, learning, evolution and adaptation, and collective behavior. DTIC

N94-33326 Minnesota Univ., Minneapolis. Dept. of Psychology.
WORKSHOP ON VISUAL PERCEPTION: COMPUTATION AND PSYCHOPHYSICS Final Report, 15 Jan. 1993 - 14 Jan. 1994
DAVID C. KNILL and WHITMAN RICHARDS 1 Mar. 1994 15 p Workshop held in Chatham, MA, 14-17 Jan. 1993 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F49620-93-1-0124)
(AD-A278412; AFOSR-94-0219TR) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

The workshop brought together researchers in computational vision and psychophysics to discuss ways of conceptualizing and modeling problems in visual perception. Such a conceptualization requires common frameworks for formulating problems in perception. Workshop participants considered what formal tools and structures these frameworks should provide in order to be most useful for the study of human vision. Several recently proposed frameworks based on the formulation of Bayesian, probabilistic inference served as the focal point for evaluation and discussion. DTIC

N94-33327# Yale Univ., New Haven, CT. School of Medicine.
STRESS-INDUCED ENHANCEMENT OF THE STARTLE REFLEX Final Report, 1 Oct. 1990 - 30 Sep. 1993
MICHAEL DAVIS 30 Sep. 1993 8 p
(Contract AF-AFOSR-0035-91)
(AD-A278414; AFOSR-94-0173TR) Avail: CASI HC A02/MF A01

A major goal of the work funded by the Air Force has been to evaluate the role of the amygdala in both conditioned and unconditioned fear and anxiety. This work showed that the central nucleus of the amygdala, and its direct projection to a particular part of the acoustic startle pathway, were critically involved in the performance or expression of fear-potentiated startle. DTIC

N94-33333 Wake Forest Univ., Winston-Salem, NC. Dept. of Physiology and Pharmacology.
NEOSTRIATAL NEURONAL ACTIVITY AND BEHAVIOR Final Report, 1 Jun. 1992 - 30 Sep. 1993
DONALD J. WOODWARD 30 Sep. 1993 4 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F49620-92-J-0301)
(AD-A278429; AFOSR-94-0175TR) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

The overall goal of the 'University Initiative' project 'Neostriatal Neuronal Activity and Behavior' was to establish a new technical approach for the study of ensembles of single neurons in CNS during tasks requiring sensory motor integration. An aim was to establish methodology for chronic implant of arrays of recording electrodes in rat neostriatum and other regions. Instrumentation was to be developed to allow amplification and spike sorting to be done for up to 64 concurrent spike trains. An acquisition system was to record the time events of spike trains, stimuli, and behavior events for up to four days continuously. An analysis capability was to provide a wide range of standard analysis procedures including histograms and rasters. A new approach for neuron ensemble analysis was to be developed to deal with statistical fluctuations of ensemble patterned activity across trials. Experimental studies were to study neuronal population activity during a series of tasks including tone and treadmill locomoting and a delayed matching-to-sample task with a spatial memory requirement. Computational simulation was to be done to explore short-term memory properties of the local circuitry between medium spiny neurons in neostriatum. Development of the experimental approach was the primary goal. Extended experimental analysis was secondary for this type of developmental project. DTIC

54
MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N94-31429*# University of Southern California, Los Angeles. Inst. of Aerospace Systems Architecture and Technology.
THE NOMAD EXPLORER ASSEMBLY ASSIST VEHICLE: AN ARCHITECTURE FOR RAPID GLOBAL EXTRATERRESTRIAL BASE INFRASTRUCTURE ESTABLISHMENT
MADHU THANGAVELU (Rockwell International Corp., Downey, CA.) in NASA. Marshall Space Flight Center, The Second Annual International Space University Alumni Conference p 34-56 Feb. 1994
Avail: CASI HC A03/MF A02

Traditional concepts of lunar bases describe scenarios where components of the bases are landed on the lunar surface, one at a time, and then put together to form a complete stationary lunar habitat. Recently, some concepts have described the advantages of operating a mobile or 'roving' lunar base. Such a base vastly improves the exploration range from a primary lunar base. Roving bases would also allow the crew to first deploy, test, operationally certify, and then regularly maintain, service, and evolve long life-cycle facilities like observatories or other science payload platforms that are operated far apart from each other across the extraterrestrial surface. The Nomad Explorer is such a mobile lunar base. This paper describes the architectural program of the Nomad Explorer, its advantages over a stationary lunar base, and some of the embedded system concepts which help the roving base to speedily establish a global extraterrestrial infrastructure. A number of modular autonomous logistics landers will carry deployable or erectable payloads, service, and logistically resupply the Nomad Explorer at regular intercepts along the traverse. Starting with the deployment of science experiments and telecommunication networks, and the manned emplacement of a variety of remote outposts using a unique EVA Bell system that enhances manned EVA, the Nomad Explorer architecture suggests the capability for a rapid global development of the extraterrestrial body. The Moon and Mars are candidates for this 'mission oriented' strategy. The lunar case is emphasized in this paper. Author (revised)

N94-31447* Carnegie-Mellon Univ., Pittsburgh, PA. Dept. of Computer Science.
DIGIT-EYES: VISION-BASED HUMAN HAND TRACKING
JAMES M. REHG and TAKEO KANADE 31 Dec. 1993 26 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract NGT-50559)
(NASA-CR-195913; NAS 1.26:195913; AD-A276417; CMU-CS-93-220) Avail: CASI HC A03

Passive sensing of human hand and limb motion is important for a wide range of applications from human-computer interaction to athletic performance measurement. High degree of freedom articulated mechanisms like the human hand are difficult to track because of their large state space and complex image appearance. This article describes a model-based hand tracking system, called Digit-Eyes, that can recover the state of a 27 degree of freedom hand model from gray scale images at speeds of up to 10 Hz. We employ kinematic and geometric hand models, along with a high temporal sampling rate, to decompose global image patterns into incremental, local motions of simple shapes. Hand pose and joint angles are

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estimated from line and point features extracted from images of unmarked, unadorned hands, taken from one or more viewpoints. We present some preliminary results on a three dimensional mouse interface based on the Digit-Eyes sensor. DTIC

N94-31739 Naval Coastal Systems Center, Panama City, FL. Materials Science Branch.
THERMOTROPIC LIQUID CRYSTALS: A VARIABLE CLO MATERIAL
RAND R. BIGGERS In Defence and Civil Inst. of Environmental Medicine, Proceedings of the DCIEM Diver Thermal Protection Workshop p 33-39 Jan. 1992
Avail: Issuing Activity (Defence and Civil Inst. of Environmental Medicine, 1133 Sheppard Ave. W., P.O. Box 2000, North York, ON M3M 3B9 Canada)

Thermotropic liquid crystals comprise a class of mesophase materials with variable heat transfer characteristics. Utilization of their unique thermal transport properties in a diving garment would add an additional dimension of flexibility to diver thermal protection. The response of the effective thermal conductivity of liquid crystals to applied fields is sufficiently strong that an excellent opportunity exists to exploit the heat transfer characteristics of these materials to produce variable-Clo garments. The effects of alternating current fields on the thermal transfer rate in N-(p-methoxy benzylidene)-p-butylaniline (MBBA) were studied. The results suggest that the best utilization of liquid crystals would be in a cooling mode. The minimum thermal conductivity of MBBA gives it a Clo value roughly one half that of an equivalent thickness of neoprene. It is expected that when more liquid crystals are accurately measured, they might approach the Clo values of thinsulate. Recent experiments have suggested that inclusion of liquid crystal cells in a thinsulate undergarment would provide a cooling ability while retaining about 95 percent of the garment's insulating ability. A composite thinsulate and liquid crystal undergarment could provide nine hours of protection against hypothermia, compared to three hours with the conventional garment. Author (CISTI)

N94-31839 Selskapet for Industriell og Teknisk Forskning, Trondheim (Norway). Div. of Safety and Reliability.
SYSTEMS FOR THE MONITORING OF WORKING CONDITIONS RELATING TO HEALTH AND SAFETY: EXTENSIVE DESCRIPTION. NORWAY
S. SKLET 2 Sep. 1993 76 p
(PB94-138542; STF75-A93042) Avail: Issuing Activity (National Technical Information Service (NTIS))

Different Norwegian systems for the monitoring of working conditions relating to health and safety are described in this report. The descriptions will be part of the European Health and Safety Database. The European Health and Safety Database is a product of the European Foundation for the Improvement of Living and Working Conditions (European Foundation) and contains descriptions of information systems useful for monitoring working conditions related to health and safety in the European Community Countries and other European countries. The project has been sponsored by the Nordic Council of Ministers, Working Environment Committee. NTIS

N94-31852 Technische Univ., Berlin (Germany). Inst. fuer Luft- und Raumfahrt.
DESIGN OF A LOGISTICS MODEL FOR BUILDING AND SUPPORTING A LUNAR STATION [ENTWURF EINES LOGISTIK-MODELLS FUER DEN BAU UND DEN BETRIEB EINER MONDSTATION]
RICHARD HUHN 1 May 1993 85 p In GERMAN Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(ILR-MITT-282(1993); ETN-94-95744) Avail: CASI HC A05

A simulation model that allows five transportation systems for logistic support of a lunar base to be compared on the basis of their cost effectiveness is presented. Over a life cycle of 50 years, four different growth rates of the lunar base were considered. The annual average size of the scientific staff and the annual lunar output were given as input data of this model. Taking into account the increasing annual lunar output and the required propellants per year for the transportation system, the annual volume of imports, the annual number of launches, the average costs per year, and the cost effectiveness were calculated. This simulation model consists of about 65 equations. To check the plausibility of the calculated trends, the results of a standard run are presented. ESA

N94-31954 Michigan Univ., Ann Arbor.
TRIPPING OVER OBSTACLES: BIOMECHANICAL ANALYSES OF HOW YOUNG AND OLD TRY TO AVOID IT Ph.D. Thesis
HSIEH-CHING CHEN 1993 135 p
Avail: Univ. Microfilms Order No. DA9319500

The objective of this research was to determine the biomechanical factors that significantly affect gait patterns, planning, motor control, and fall avoidance strategies required to successfully negotiate obstacles. The results of this research are presented as a series of three experimental studies and a biomechanical model simulation study. In the first study, the gait patterns of healthy young and old adults were examined as they approached and stepped over fixed obstacles of different heights. The results suggest that the old adults adopt a more conservative strategy for crossing obstacles than young adults. The second study examined the effectiveness of avoidance strategies used by young and old healthy adults as they walked and stepped over a virtual obstacle that appeared from 200 to approximately 1000 ms before reaching it. The results suggested that delays as small as 50 or 100 ms in noticing or reacting to obstacles may significantly lower subjects' rates of success in avoiding them. Age group differences were found, but they were not pronounced. The third study examined the effect of divided attention in young and old healthy adults as they walked and stepped over an obstacle under time-critical conditions. The results showed attention distraction significantly decreased subjects' ability to avoid obstacles under time critical conditions. The old had a significantly higher risk of obstacle contact than the young under these conditions. In the final study, two different biomechanical models were used to simulate the response to a trip. A phase 1 model predicted body kinematics and dynamics from swing foot toe-off until 100 ms after contact of the swing foot with the obstacle. The phase 2 model predicted the recovery response from 100 ms after obstacle contact until the swing foot was extended forward and recontacted the ground or for 200 ms if recontact had not occurred by that time. The results showed the maximum available rate of torque development in the swing hip flexor and the stance leg ankle plantaflexor muscles may largely determine the ability to recover from a trip.
Dissert. Abstr.

N94-32034 Software Options, Inc., Cambridge, MA.
BEYOND THE READ-EVAL LOOP: THE ARTIFACTS SYSTEM
MIKE KARR 14 Feb. 1994 19 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract N00014-85-C-0710; N00014-90-C-0024)
(AD-A276589) Avail: CASI HC A03

The purpose of the Artifacts System is to structure complex, evolving data, to assist users in their cooperative effort to develop such data, and to integrate the tools that operate on and produce this data. A key element in the design is to eliminate what is the usual interaction with a computer-based system: run a tool to achieve a desired effect. Rather, users of the Artifacts System set up structures that indicate desired results and browse these structures in hypertext-like fashion; tool invocation is usually implicit. Version and configuration management is an integral part of the system, not a facility on the side. DTIC

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N94-32171# Army Aeromedical Research Lab., Fort Rucker, AL.
EVALUATION OF INTENSITY DISTRIBUTION PROFILES FOR US. ARMY ROTORCRAFT POSITION LIGHTING ADAPTED FOR IMAGE INTENSIFIER OPERATIONS Final Report
ELLEN H. SNOOK, CLARENCE E. RASH, and MALCOLM N. COLBERT Sep. 1993 175 p
(Contract DA PROJ. 3M1-62787-A-879)
(AD-A276459; USAARL-93-36) Avail: CASI HC A08/MF A02

Compatibility problems with image intensifier (I2) devices and cockpit/interior lighting have been investigated and well documented. However, I2 compatibility with position/exterior lighting is only in the early stages of development. In the Army aviation community, attempts have been made to reduce the detrimental effects of position light intensity on I2 devices by operating lights in dim mode or by masking lights. In these modified lighting configurations, requirements in Federal Aviation Administration (FAA) regulations are not always satisfied. In this investigation, the intensity distribution profiles for currently employed lighting strategies were evaluated. Further subjective evaluation of the entire position light system, as a whole, is strongly recommended in order to determine all factors that may have impact on the modification of exterior lighting and/or requirements. Exterior lighting must be acceptable in both the civilian/military aviation environments. DTIC

N94-32302 Logicon Technical Services, Inc., Dayton, OH.
METHODS FOR MEASURING CHARACTERISTICS OF NIGHT VISION GOGGLES Final Report, Mar. 1989 - Nov. 1991
HARRY L. TASK, RICHARD T. HARTMAN, PETER L. MARASCO, and ANNETTE R. ZOBEL Oct. 1993 55 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract AF PROJ. 7184)
(AD-A277046; AL/CF-TR-1993-0177) Avail: CASI HC A04

There are many parameters that are used to describe and specify night vision goggles (NVG's) such as resolution, field of view, brightness gain, distortion, etc. However, standardized test procedures for determining the value of these parameters have not been established. Informal comparison studies have shown that measurements of some of these parameters may vary considerably (as much as a factor of two) depending on the method, equipment, and procedures used to make the measurements. The purpose of this technical report is to document specific procedures for measuring most of the major parameters used to specify NVG's to help standardize methodology and improve accuracy and comparability between measuring organizations. DTIC

N94-32379# Army Aeromedical Research Lab., Fort Rucker, AL.
UNIT SPECIFIC CREW REST STRATEGIES: PHASE 1 EVALUATION OF THE 1/212TH AVIATION BATTALION DURING SHIFTWORK TRANSITIONS Final Report
CARLOS A. COMPERATORE, JAMES A. CHIARAMONTE, KATHY L. LAWHORN, and LAWRENCE W. ALLAN Jan. 1994 51 p
(Contract DA PROJ. 3M1-62787-A-879)
(AD-A277122; USAARL-94-3) Avail: CASI HC A04/MF A01

Army aviation commanders are deeply concerned with the implementation of crew rest strategies which are both practical and effective. Maintaining peak performance of individuals rotating from one work shift to another is of paramount concern. General guidelines often provide appropriate information, but they do not provide strategies or specific schedules of crew rest tailored to the unit's specific mission demands, environmental conditions, and strength. A complement to general recommendations and guidelines is the use of unit-specific crew rest strategies. This concept involves a two-phase process. In phase one, the unit's existing response to a characteristic mission or training exercise is evaluated by determining the amount of rest obtained by a representative sample of crew members. The results of the phase 1 evaluations provide descriptive quantitative information of daily rest periods, and the impact of mission driven work schedules and environmental conditions on crew rest quality. Phase 2 provides rhythms, sleep/wake cycles, shiftwork schedules, and methods for regulating the body's biological clock to prevent sleep loss during characteristic mission. This report contains a summation of the results of a phase 1 evaluation of shiftwork schedules used by the 1/212th Army Aviation Training Battalion at Fort Rucker, Alabama. Shiftwork schedules used by 1/212th aviators and aircrew included shifts from daytime to early morning, to nighttime, and to afternoon duty hours. DTIC

N94-32435*# Ergonomic-Interface Keyboard Systems, Inc., La Jolla, CA.
THE VERTICAL
STEPHEN L. ALBERT and JEFFREY B. SPENCER *In* NASA, Washington, Technology 2003: The Fourth National Technology Transfer Conference and Exposition, Volume 2 p 124-129 Feb. 1994
Avail: CASI HC A02/MF A04

'THE VERTICAL' computer keyboard is designed to address critical factors which contribute to Repetitive Motion Injuries (RMI) (including Carpal Tunnel Syndrome) in association with computer keyboard usage. This keyboard splits the standard QWERTY design into two halves and positions each half 90 degrees from the desk. In order to access a computer correctly, 'THE VERTICAL' requires users to position their bodies in optimal alignment with the keyboard. The orthopaedically neutral forearm position (with hands palms-in and thumbs-up) reduces nerve compression in the forearm. The vertically arranged keypad halves ameliorate onset occurrence of keyboard-associated RMI. By utilizing visually-reference mirrored mylar surfaces adjustable to the user's eye, the user is able to readily reference any key indicia (reversed) just as they would on a conventional keyboard. Transverse adjustability substantially reduces cumulative musculoskeletal discomfort in the shoulders. 'THE VERTICAL' eliminates the need for an exterior mouse by offering a convenient finger-accessible curser control while the hands remain in the vertically neutral position. The potential commercial application for 'THE VERTICAL' is enormous since the product can effect every person who uses a computer anywhere in the world. Employers and their insurance carriers are spending hundreds of millions of dollars per year as a result of RMI. This keyboard will reduce the risk. Author

N94-32453*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ADVANCED TELEOPERATION: TECHNOLOGY INNOVATIONS AND APPLICATIONS
PAUL S. SCHENKER, ANTAL K. BEJCZY, and WON S. KIM *In* NASA, Washington, Technology 2003: The Fourth National Technology Transfer Conference and Exposition, Volume 2 p 288-292 Feb. 1994
Avail: CASI HC A01/MF A04

The capability to remotely, robotically perform space assembly, inspection, servicing, and science functions would rapidly expand our presence in space, and the cost efficiency of being there. There is considerable interest in developing 'telerobotic' technologies, which also have comparably important terrestrial applications to health care, underwater salvage, nuclear waste remediation and other. Such tasks, both space and terrestrial, require both a robot and operator interface that is highly flexible and adaptive, i.e., capable of efficiently working in changing and often casually structured environments. One systems approach to this requirement is to augment traditional teleoperation with computer assists — advanced teleoperation. We have spent a number of years pursuing this approach, and highlight some key technology developments and their potential commercial impact. This paper is an illustrative summary rather than self-contained presentation; for completeness, we include representative technical references to our work which will allow the reader to follow up items of particular interest. Author

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N94-32580 Taylor (S. R.) and Associates, Bartlesville, OK.
NOVEL ULTRASONIC METHOD FOR FOOD HYDRATION Final Report, Mar. - Oct. 1993
S. R. TAYLOR and J. C. HANSEN Mar. 1994 33 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract DAAK60-93-C-0020)
(AD-A277411; NATICK-TR-94/014) Avail: CASI HC A03

This report summarizes the work accomplished in the successful completion of phase 1 of this SBIR project. The overall conclusion is that the ultrasonic activation during aerosol dehydration results in significant increases in evaporation/dehydration rates. These improvements in dehydration rates allow for much more rapid and energy-efficient processing, thus reducing dehydration costs. DTIC

N94-32596 Pacific Northwest Lab., Richland, WA.
THE ROLE OF GUIDELINE-BASED DESIGN TOOLS
J. A. FOX Oct. 1993 6 p Presented at the Human Factors and Ergonomics Society Meeting, Seattle, WA, 11-15 Oct. 1993 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract DE-AC06-76RL-01830)
(DE94-007482; PNL-SA-21969; CONF-9310100-8) Avail: CASI HC A02

User System Interface (USI) design guidelines are one of the more popular tools that have been developed to aid designers in creating effective interfaces. When used properly, guidelines can provide the basis for a structured design methodology throughout the system life cycle. A survey published by Mosier and Smith (1986) provides an in-depth account of guideline usage. That 1986 survey showed that guidelines were used in varying degrees by virtually all types of people involved in the design and evaluation of USIs. Design guidelines are one of the older USI design tools, and the continued popularity of guidelines can be seen by the continued updating and expansion of guideline compendiums to keep up with new advances in the field. DOE

N94-32609 Aerospace Medical Research Labs., Brooks AFB, TX.
AIRCREW EYE/RESPIRATORY PROTECTION (AERP): 16-HOUR EXTENDED WEAR EVALUATION OF CHEMICAL PROTECTIVE EQUIPMENT Final Report, 9 Feb. - 31 Dec. 1993
SARAH A. NUNNELEY and ROBERTA L. RUSSELL Feb. 1994 14 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A277288; AL-TP-1993-0014) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

Sixteen-hour wear tests were conducted for the aircrew eye/respiratory protection (AERP) and associated clothing and equipment. Two subjects each carried out simulated tanker/transport and fighter/attack scenarios. No major problems were encountered. DTIC

N94-32697*# Umpqua Research Co., Myrtle Creek, OR. Aerospace Div.
CATALYTIC METHODS USING MOLECULAR OXYGEN FOR TREATMENT OF PMMS AND ECLSS WASTE STREAMS, VOLUME 2 Final Report, Apr. 1990 - Apr. 1992
JAMES R. AKSE 12 May 1992 217 p
(Contract NAS8-38490; SBIR-12.02-5201(VOL-2))
(NASA-CR-190299; NAS 1.26:190299) Avail: CASI HC A10/MF A03

Catalytic oxidation has proven to be an effective addition to the baseline sorption, ion exchange water reclamation technology which will be used on Space Station Freedom (SSF). Low molecular weight, polar organics such as alcohols, aldehydes, ketones, amides, and thiocarbamides which are poorly removed by the baseline multifiltration (MF) technology can be oxidized to carbon dioxide at low temperature (121 C). The catalytic oxidation process by itself can reduce the Total Organic Carbon (TOC) to below 500 ppb for solutions designed to model these waste waters. Individual challenges by selected contaminants have shown only moderate selectivity towards particular organic species. The combined technology is applicable to the more complex waste water generated in the Process Materials Management System (PMMS) and Environmental Control and Life Support System (ECLSS) aboard SSF. During the phase 3 Core Module Integrated Facility (CMIF) water recovery tests at NASA MSFC, real hygiene waste water and humidity condensate were processed to meet potable specifications by the combined technology. A kinetic study of catalytic oxidation demonstrates that the Langmuir-Hinshelwood rate equation for heterogeneous catalysts accurately represent the kinetic behavior. From this relationship, activation energy and rate constants for acetone were determined. Author (revised)

N94-32936*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
AN INVESTIGATION OF ACOUSTIC NOISE REQUIREMENTS FOR THE SPACE STATION CENTRIFUGE FACILITY
TIMOTHY CASTELLANO Feb. 1994 28 p
(Contract RTOP 960-60-90)
(NASA-TM-108811; A-94050; NAS 1.15:108811) Avail: CASI HC A03/MF A01

Acoustic noise emissions from the Space Station Freedom (SSF) centrifuge facility hardware represent a potential technical and programmatic risk to the project. The SSF program requires that no payload exceed a Noise Criterion 40 (NC-40) noise contour in any octave band between 63 Hz and 8 kHz as measured 2 feet from the equipment item. Past experience with life science experiment hardware indicates that this requirement will be difficult to meet. The crew has found noise levels on Spacelab flights to be unacceptably high. Many past Ames Spacelab life science payloads have required waivers because of excessive noise. The objectives of this study were (1) to develop an understanding of acoustic measurement theory, instruments, and technique, and (2) to characterize the noise emission of analogous Facility components and previously flown flight hardware. Test results from existing hardware were reviewed and analyzed. Measurements of the spectral and intensity characteristics of fans and other rotating machinery were performed. The literature was reviewed and contacts were made with NASA and industry organizations concerned with or performing research on noise control. Author

N94-33050*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
USE OF A PITCH ADJUSTABLE FOOT RESTRAINT SYSTEM: OPERATOR STRENGTH CAPABILITY AND LOAD REQUIREMENTS
ROBERT P. WILMINGTON (Lockheed Engineering and Sciences Co., Houston, TX.), JEFFREY POLINER (Lockheed Engineering and Sciences Co., Houston, TX.), and GLENN K. KLUTE May 1994 33 p
(Contract NAS9-18800)
(NASA-TP-3477; S-764; NAS 1.60:3477) Avail: CASI HC A03/MF A01

The zero-gravity environment creates a need for a proper human body restraint system to maintain a comfortable posture with less fatigue and to maximize productivity. In addition, restraint systems must be able to meet the loading demands of maintenance and assembly tasks performed on orbit. The shuttle's primary intravehicular astronaut restraint system is currently a foot loop design that attaches to flat surfaces on the shuttle, allowing for varying mounting locations and easy egress and ingress. However, this design does not allow for elevation, pitch, or foot loop length adjustment. Several prototype foot restraint systems are being evaluated for use aboard the space station and the space shuttle. The JSC Anthropometry and Biomechanics Laboratory initiated this study to quantify the maximum axial forces and moments that would be induced on a foot loop type of restraint while operators performed a torque wrench task, also allowing for angling the restraint pitch

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angle to study yet another effect. Results indicate that the greatest forces into the torque wrench and into the foot restraint system occur while the operator performs an upward effort. This study did not see any significant difference in the operators' force due to pitch orientation. Thus, in a work environment in which hand holds are available, no significant influence of the pitch angle on forces imparted to the restraint system existed. Author (revised)

N94-33084 State Univ. of New York, Buffalo. Dept. of Physiology.
EFFECTS OF COMBINED BREATHING IMPEDIMENTS ON DIVER'S RESPIRATORY PERFORMANCE Annual Progress Report, 1 Feb. 1993 - 31 Jan. 1994
CLAES LUNDGREN 31 Jan. 1994 9 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract N00014-93-1-0509)
(AD-A277437) Avail: CASI HC A02

Combinations of flow resistance (R), elastance (E) and static lung loading are present to varying degrees in all breathing gear for divers. We have, in earlier studies, determined the maximal acceptable levels for two of these loads, when acting alone, to be: E: 7 cm H20/L, R: such that the external work of breathing equals 1.5 to 2.0 J/L. Fractions of the acceptable levels of R and E (when acting alone) were combined such that the total fraction was 1. The subjects were exposed to five of these combinations (%R/%E): 100/0, 75/25, 50/50, 25/75, 0/100. No static lung load was imposed. Results are from 3, in an ongoing series of 12, submerged, air-breathing divers exposed in a hyperbaric chamber to 1.45 and 6.8 ATA; exercise was performed in the prone position at 60% of VO(2). The mean end-tidal CO2 values were 46.7 mm Hg at the shallow depth and 52.4 mm Hg at the great depth but were unaffected by the R/E combination. V(E) was not affected differently by the R/E combinations, but the tidal volumes were reduced 8-20% by increased E. The ERV was reduced by about 20% with the higher E. Similarly, the VC was reduced by about 15%. The T(sub i)/T(sub tot) was not affected by the R/E combinations but it increased from 0.15 to 0.47 with depth. The dyspnea scores were not different for the different loads. This leads to the conclusion that R and E are additive in their effects on divers' respiratory performance. DTIC

N94-33171 Federal Aviation Administration, Cambridge, MA.
COCKPIT ELECTRONIC DISPLAY WORKSHOP: PROCEEDINGS (COMPUTER DISKETTE)
Dec. 1993 2 p Workshop was held
(AD-M000330; DOT-VNTSC-FAA-93-21-CD; DOT/FAA/RD-93/42-CD; NONP-DTIC-DK-94-11178) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

Thirty-six government, academic, and industry human factors professionals participated in a workshop convened at the Volpe National Transportation Systems Center to identify human factors issues associated with depicting terminal area operations information on electronic cockpit displays. Two working groups, formed from the meeting attendees, identified a variety of research issues associated with the identification, distribution, and electronic presentation of terminal area information to flight crews. These two disks contain the original workshop proceedings formatted in Microsoft Word 5.1 for Macintosh. DTIC

N94-33349 Wright Lab., Wright-Patterson AFB, OH.
AN EXPERIMENTAL STUDY OF PILOT/VEHICLE DYNAMICS USING A TILT ROTOR FLYING MACHINE Final Report, May 1992 - Jun. 1993
DAVID B. DOMAN Jun. 1993 291 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A277516; WL-TR-93-3063) Avail: CASI HC A13

A laboratory Tilt Rotor Flying Machine (TROFM) is designed and built for the purpose of conducting an experimental study of the effects of command systems on human pilot behavior. The aircraft is mounted on a two-axis pivot stand which gives the fuselage 2 degrees of freedom; pitch and yaw. Analytical models are derived using Lagrangian and Newtonian techniques. Identification of the aircraft characteristics is based on a nonparametric Discrete Fourier Transform technique and a maximum likelihood parameter estimation scheme. Attitude command, rate command and unaugmented systems are designed and implemented in real time using a digital computer. An investigation of the effects of command systems, displays and tasks on human pilot behavior is conducted. Pilot and pilot-vehicle describing functions are obtained from time histories of dynamic tracking tasks where the pilot attempts to track a random appearing input. Correlations between Cooper-Harper ratings and quantitative descriptions of pilot behavior are made. The experimental results compare favorably to the classical theory of man-machine system dynamics which is based on the cross-over model. The results of this study indicate that desirable controlled elements in man-machine systems have the characteristics of a simple tracker. DTIC

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SPACE BIOLOGY

Includes exobiology; planetary biology; and extraterrestrial life.

N94-32389* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
THE QUEST FOR CONTACT (Videotape)
1 Feb. 1992 Videotape: 32 min. playing time, in color, with sound (NASA-TM-109778; NONP-NASA-VT-94-9978) Avail: CASI VHS A01/BETA A22

This video details the history and current efforts of NASA's Search for Extraterrestrial Intelligence program. The video explains the use of radiotelescopes to monitor electromagnetic frequencies reaching the Earth, and the analysis of this data for patterns or signals that have no natural origin. The video presents an overview of Frank Drake's 1960 'Ozma' experiment, the current META experiment, and planned efforts incorporating an international Deep Space Network of radiotelescopes that will be trained on over 800 stars. CASI

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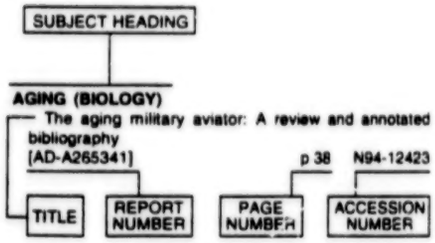
Typical Subject Index Listing



The subject heading is a key to the subject content of the document. The title is used to provide a description of the subject matter. When the title is insufficiently descriptive of document content, a title extension is added, separated from the title by three hyphens. The accession number and the page number are included in each entry to assist the user in locating the abstract in the abstract section. If applicable, a report number is also included as an aid in identifying the document. Under any one subject heading, the accession numbers are arranged in sequence.

A

ABERRATION
Visual neural development and chromatic aberration
[AD-A277402] p 234 N94-32345

ACOUSTIC ATTENUATION
Determination of multiple sound sources
[AD-A277379] p 233 N94-32096

ACOUSTIC MEASUREMENT
An investigation of acoustic noise requirements for the Space Station centrifuge facility
[NASA-TM-108811] p 240 N94-32936

ADAPTATION
Isolating strain parameters correlated to skeletal adaptation p 231 N94-31960

ADRENERGICS
Review of pharmacological approach to improve cold tolerance p 230 N94-31740

AEROSPACE MEDICINE
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 388)
[NASA-SP-7011(388)] p 229 N94-31414
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 389)
[NASA-SP-7011(389)] p 231 N94-32347
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 385)
[NASA-SP-7011(385)] p 231 N94-32348

AGE FACTOR
Tripping over obstacles: Biomechanical analyses of how young and old try to avoid it p 238 N94-31954

AIRCRAFT LIGHTS
Evaluation of intensity distribution profiles for US. Army rotorcraft position lighting adapted for image intensifier operations
[AD-A276459] p 238 N94-32171

AIRCRAFT PILOTS
Unit specific crew rest strategies: Phase 1 evaluation of the 1/212th Aviation Battalion during shiftwork transitions
[AD-A277122] p 239 N94-32379

ALBUMINS
Characterization and utilization of opiate-like hibernation factors
[AD-A278136] p 229 N94-33098

ALGORITHMS
Fast nonsupervised 3D registration of PET and MR images of the brain
[TELECOM-93-C-006] p 232 N94-33069

ANCHORS (FASTENERS)
Use of a pitch adjustable foot restraint system: Operator strength capability and load requirements
[NASA-TP-3477] p 240 N94-33050

ANESTHESIA
Development and enhancement of a model of performance and decision making under stress in a real life setting
[AD-A276029] p 233 N94-31440

ANIMALS
From animals to animats
[AD-A277427] p 236 N94-33241

ANXIETY
Stress-induced enhancement of the startle reflex
[AD-A278414] p 237 N94-33327

ARMED FORCES (UNITED STATES)
Medical problems in high mountain environments. A handbook for medical officers
[AD-A278095] p 233 N94-33268

ARTIFICIAL INTELLIGENCE
From animals to animats
[AD-A277427] p 236 N94-33241

AUDIO SIGNALS
Auditory perception
[AD-A277414] p 234 N94-32419

AUDITORY PERCEPTION
Determination of multiple sound sources
[AD-A277379] p 233 N94-32096
Auditory perception
[AD-A277414] p 234 N94-32419
Mechanisms of temporal pattern discrimination by human observers
[AD-A277407] p 235 N94-32577
Models of the neuronal mechanisms of target localization of the barn owl
[AD-A277332] p 232 N94-32623

AUTONOMY
From animals to animats
[AD-A277427] p 236 N94-33241

B

BACKGROUND NOISE
Visual processing of object velocity and acceleration
[AD-A277425] p 236 N94-32998

BACTERIA
Spectral inhomogeneity of the bacterial light-harvesting antennae: Causes and consequences
[ETN-94-96020] p 227 N94-31533

BEHAVIOR
From animals to animats
[AD-A277427] p 236 N94-33241

BIBLIOGRAPHIES
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 388)
[NASA-SP-7011(388)] p 229 N94-31414

BINAURAL HEARING
Mechanisms of temporal pattern discrimination by human observers
[AD-A277407] p 235 N94-32577
Models of the neuronal mechanisms of target localization of the barn owl
[AD-A277332] p 232 N94-32623

BIOACOUSTICS
Minutes: Accredited Standards Committee on Bioacoustics, S3. US TAG for ISO/TC 43, acoustics, IEC/TC 29 electroacoustics, and ISO/TC 108/SC4 human exposure to mechanical vibration and shock
[AD-A276201] p 229 N94-31490

BIOASSAY
Characterization and utilization of opiate-like hibernation factors
[AD-A278136] p 229 N94-33098

BIOASTRONAUTICS
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 388)
[NASA-SP-7011(388)] p 229 N94-31414
Muscle disuse through tail-suspension: Etiology and therapeutics p 230 N94-31746

BIOCHEMISTRY
Development and application of photosensitive device systems to studies of biological and organic materials
[DE94-008503] p 226 N94-32516
Ninth International Workshop on Plant Membrane Biology
[DE94-005690] p 226 N94-32769

BIOCONVERSION
Spectral inhomogeneity of the bacterial light-harvesting antennae: Causes and consequences
[ETN-94-96020] p 227 N94-31533

BIODYNAMICS
Tripping over obstacles: Biomechanical analyses of how young and old try to avoid it p 238 N94-31954
Use of a pitch adjustable foot restraint system: Operator strength capability and load requirements
[NASA-TP-3477] p 240 N94-33050

BIOENGINEERING
Model-based scientific discovery: A study in space bioengineering p 233 N94-31990

BIOINSTRUMENTATION
Perspectives of glucose sensing based on a charge-modulating competition reaction
[ISBN-9-09-005754-4] p 229 N94-31652

BIOLOGICAL EFFECTS
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 389)
[NASA-SP-7011(389)] p 231 N94-32347
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 385)
[NASA-SP-7011(385)] p 231 N94-32348

BIOLOGICAL MODELS (MATHEMATICS)
Tripping over obstacles: Biomechanical analyses of how young and old try to avoid it p 238 N94-31954
Model-based scientific discovery: A study in space bioengineering p 233 N94-31990
On the reciprocal relationship between life histories and population dynamics
[CWI-AM-R9302] p 227 N94-32226
The legacy of Kermack and McKendrick
[CWI-AM-R9304] p 227 N94-32228
Numerical model of the thermal behavior of an extremity in a cold environment including counter-current heat exchange between the blood vessels
[AD-A278099] p 232 N94-33040
Workshop on Visual Perception: Computation and Psychophysics
[AD-A278412] p 236 N94-33326

BIOMASS
Light utilization and photoinhibition of photosynthesis in marine phytoplankton
[DE94-005505] p 228 N94-32896

BIOPHYSICS
Spectral inhomogeneity of the bacterial light-harvesting antennae: Causes and consequences
[ETN-94-96020] p 227 N94-31533
Future directions of nonlinear dynamics in physical and biological systems. (Physica D nonlinear, volume 68, number 1)
[AD-A278085] p 229 N94-33250

BIOSYNTHESIS
Towards a detailed understanding of the structural variability in lignins: A new approach
[DE94-007449] p 227 N94-32267

000017

The magnesium chelation step in chlorophyll biosynthesis
[DE94-008727] p 228 N94-32890

BLOOD
Numerical model of the thermal behavior of an extremity in a cold environment including counter-current heat exchange between the blood vessels
[AD-A278099] p 232 N94-33040

BLOOD PLASMA
Characterization and utilization of opiate-like hibernation factors
[AD-A278136] p 229 N94-33098

BLOOD VESSELS
Numerical model of the thermal behavior of an extremity in a cold environment including counter-current heat exchange between the blood vessels
[AD-A278099] p 232 N94-33040

BONES
Isolating strain parameters correlated to skeletal adaptation p 231 N94-31960

BRAIN
Sensory sensitivities and discriminations and their roles in aviation
[AD-A277312] p 234 N94-32276
The organization of the suprachiasmatic circadian pacemaker of the rat and its regulation by neurotransmitters and modulators
[AD-A277324] p 228 N94-32622
Fast nonsupervised 3D registration of PET and MR images of the brain
[TELECOM-93-C-006] p 232 N94-33069

BURNS (INJURIES)
Development of a video fluorescence system for assessing burn depth
[AD-A278127] p 232 N94-33092

C

CAFFEINE
Review of pharmacological approach to improve cold tolerance p 230 N94-31740

CARBON
Light utilization and photoinhibition of photosynthesis in marine phytoplankton
[DE94-005505] p 228 N94-32896

CATALYSIS
Catalytic methods using molecular oxygen for treatment of PMMS and ECLSS waste streams, volume 2
[NASA-CR-190299] p 240 N94-32697
The magnesium chelation step in chlorophyll biosynthesis
[DE94-008727] p 228 N94-32890

CELL MEMBRANES (BIOLOGY)
Ninth International Workshop on Plant Membrane Biology
[DE94-005690] p 228 N94-32769

CELLS (BIOLOGY)
Ninth International Workshop on Plant Membrane Biology
[DE94-005690] p 228 N94-32769

CENTRAL NERVOUS SYSTEM
Neostriatal neuronal activity and behavior
[AD-A278429] p 237 N94-33333

CENTRIFUGES
An investigation of acoustic noise requirements for the Space Station centrifuge facility
[NASA-TM-108811] p 240 N94-32936

CHARGE COUPLED DEVICES
Development and application of photosensitive device systems to studies of biological and organic materials
[DE94-008503] p 228 N94-32516

CHELATION
The magnesium chelation step in chlorophyll biosynthesis
[DE94-008727] p 228 N94-32890

CHEMICAL BONDS
A genetic algorithm based method for docking flexible molecules
[DE94-007525] p 227 N94-32269

CHEMICAL DEFENSE
Aircrew Eye/Respiratory Protection (AERP): 16-hour extended wear evaluation of chemical protective equipment
[AD-A277288] p 240 N94-32609

CHLOROPHYLLS
The magnesium chelation step in chlorophyll biosynthesis
[DE94-008727] p 228 N94-32890

CHLOROPLASTS
The magnesium chelation step in chlorophyll biosynthesis
[DE94-008727] p 228 N94-32890

CIRCADIAN RHYTHMS
Unit specific crew rest strategies: Phase 1 evaluation of the 1/212th Aviation Battalion during shiftwork transitions
[AD-A277122] p 239 N94-32379
The organization of the suprachiasmatic circadian pacemaker of the rat and its regulation by neurotransmitters and modulators
[AD-A277324] p 228 N94-32622

CLINICAL MEDICINE
Development of a video fluorescence system for assessing burn depth
[AD-A278127] p 232 N94-33092
Characterization and utilization of opiate-like hibernation factors
[AD-A278136] p 229 N94-33098

COCKPITS
Cockpit Electronic Display Workshop: Proceedings (computer diskette)
[AD-M000330] p 241 N94-33171

COGNITION
Reminding-based learning
[AD-A277424] p 236 N94-32997

COGNITIVE PSYCHOLOGY
Reading: Interaction with memory
[AD-A277547] p 235 N94-32956

COLD TOLERANCE
Review of pharmacological approach to improve cold tolerance p 230 N94-31740
Lipid metabolism in cold-exposed humans p 230 N94-31741
Validation and sensitivity analysis of Texas human thermal model predictions during cold water immersion
[AD-A275240] p 231 N94-32156
Numerical model of the thermal behavior of an extremity in a cold environment including counter-current heat exchange between the blood vessels
[AD-A278099] p 232 N94-33040

COLD WATER
Validation and sensitivity analysis of Texas human thermal model predictions during cold water immersion
[AD-A275240] p 231 N94-32156

COLOR VISION
Visual neural development and chromatic aberration
[AD-A277402] p 234 N94-32345

COMFORT
THE VERTICAL p 239 N94-32435

COMMAND GUIDANCE
An experimental study of pilot/vehicle dynamics using a tilt rotor flying machine
[AD-A277516] p 241 N94-33349

COMPUTATIONAL CHEMISTRY
A genetic algorithm based method for docking flexible molecules
[DE94-007525] p 227 N94-32269

COMPUTER AIDED DESIGN
The role of guideline-based design tools
[DE94-007482] p 240 N94-32596

COMPUTER AIDED TOMOGRAPHY
Fast nonsupervised 3D registration of PET and MR images of the brain
[TELECOM-93-C-006] p 232 N94-33069

COMPUTER ASSISTED INSTRUCTION
Virtual reality in medical education and assessment p 231 N94-32471

COMPUTER TECHNIQUES
Beyond the read-eval loop: The artifacts system
[AD-A276589] p 238 N94-32034

COMPUTER VISION
Digit-Eyes: Vision-based human hand tracking
[NASA-CR-195913] p 237 N94-31447

COMPUTERIZED SIMULATION
Model-based scientific discovery: A study in space bioengineering p 233 N94-31990
Technology transfer of operator-in-the-loop simulation p 235 N94-32472

CONDITIONED REFLEXES
Stress-induced enhancement of the startle reflex
[AD-A278414] p 237 N94-33327

CONDITIONING (LEARNING)
Stress-induced enhancement of the startle reflex
[AD-A278414] p 237 N94-33327

CONDUCTIVE HEAT TRANSFER
Numerical model of the thermal behavior of an extremity in a cold environment including counter-current heat exchange between the blood vessels
[AD-A278099] p 232 N94-33040

CONDUCTIVITY METERS
Perspectives of glucose sensing based on a charge-modulating competition reaction
[ISBN-9-09-005754-4] p 229 N94-31652

CONFERENCES
Minutes: Accredited Standards Committee on Bioacoustics, S3. US TAG for ISO/TC 43, acoustics, IEC/TC 29 electroacoustics, and ISO/TC 108/SC4 human exposure to mechanical vibration and shock
[AD-A276201] p 229 N94-31490
Proceedings of the DCIEM Diver Thermal Protection Workshop
[DCIEM-92-10] p 230 N94-31738
Cockpit Electronic Display Workshop: Proceedings (computer diskette)
[AD-M000330] p 241 N94-33171
From animals to animats
[AD-A277427] p 236 N94-33241

CONFIGURATION MANAGEMENT
Beyond the read-eval loop: The artifacts system
[AD-A276589] p 238 N94-32034

CONTROL SYSTEMS DESIGN
Investigation of drive-reinforcement learning and application of learning to flight control
[AD-A277442] p 236 N94-33053

CONTROL THEORY
Investigation of drive-reinforcement learning and application of learning to flight control
[AD-A277442] p 236 N94-33053

CORNEA
Noninvasive spectroscopic diagnosis of superficial ocular lesions and corneal infections
[DE94-006231] p 232 N94-32732

COST ANALYSIS
Design of a logistics model for building and supporting a lunar station
[ILR-MITT-282(1993)] p 238 N94-31852

COST EFFECTIVENESS
Design of a logistics model for building and supporting a lunar station
[ILR-MITT-282(1993)] p 238 N94-31852

D

DATA BASES
Systems for the monitoring of working conditions relating to health and safety: Extensive description. Norway
[PB94-138542] p 238 N94-31839

DEEP SPACE NETWORK
The quest for contact
[NASA-TM-109778] p 241 N94-32389

DEHYDRATED FOOD
Novel ultrasonic method for food hydration
[AD-A277411] p 239 N94-32580

DEHYDRATION
Novel ultrasonic method for food hydration
[AD-A277411] p 239 N94-32580

DETECTION
Perspectives of glucose sensing based on a charge-modulating competition reaction
[ISBN-9-09-005754-4] p 229 N94-31652
Visual processing of object velocity and acceleration
[AD-A277425] p 236 N94-32998

DIABETES MELLITUS
Perspectives of glucose sensing based on a charge-modulating competition reaction
[ISBN-9-09-005754-4] p 229 N94-31652

DIAGNOSIS
Development of a video fluorescence system for assessing burn depth
[AD-A278127] p 232 N94-33092

DIFFUSION
Numerical model of the thermal behavior of an extremity in a cold environment including counter-current heat exchange between the blood vessels
[AD-A278099] p 232 N94-33040

DIGITAL COMPUTERS
An experimental study of pilot/vehicle dynamics using a tilt rotor flying machine
[AD-A277516] p 241 N94-33349

DISCRIMINANT ANALYSIS (STATISTICS)
A differential theory of learning for efficient statistical pattern recognition
[AD-A277313] p 234 N94-32277

DISEASES
Muscle disuse through tail-suspension: Etiology and therapeutics p 230 N94-31746

DISPLAY DEVICES
Cockpit Electronic Display Workshop: Proceedings (computer diskette)
[AD-M000330] p 241 N94-33171
An experimental study of pilot/vehicle dynamics using a tilt rotor flying machine
[AD-A277516] p 241 N94-33349

DIVING (UNDERWATER)
Proceedings of the DCIEM Diver Thermal Protection Workshop
[DCIEM-92-10] p 230 N94-31738

Effects of combined breathing impediments on diver's respiratory performance
[AD-A277437] p 240 N94-33084

DRYING APPARATUS
Novel ultrasonic method for food hydration
[AD-A277411] p 239 N94-32580

DYES
Development of a video fluorescence system for assessing burn depth
[AD-A278127] p 232 N94-33092

DYNAMIC MODELS
On the reciprocal relationship between life histories and population dynamics
[CWI-AM-R9302] p 227 N94-32226

E

EDUCATION
Virtual reality in medical education and assessment
p 231 N94-32471

ELECTROACOUSTICS
Minutes: Accredited Standards Committee on Bioacoustics, S3. US TAG for ISO/TC 43, acoustics, IEC/TC 29 electroacoustics, and ISO/TC 108/SC4 human exposure to mechanical vibration and shock
[AD-A276201] p 229 N94-31490

ELECTROPHYSIOLOGY
The organization of the suprachiasmatic circadian pacemaker of the rat and its regulation by neurotransmitters and modulators
[AD-A277324] p 228 N94-32622

EMERGENCY BREATHING TECHNIQUES
Development and enhancement of a model of performance and decision making under stress in a real life setting
[AD-A276029] p 233 N94-31440

ENZYME ACTIVITY
Ninth International Workshop on Plant Membrane Biology
[DE94-005690] p 228 N94-32769

EPIDEMIOLOGY
The legacy of Kermack and McKendrick
[CWI-AM-R9304] p 227 N94-32228

ETIOLOGY
Muscle disuse through tail-suspension: Etiology and therapeutics p 230 N94-31746

EVOKED RESPONSE (PSYCHOPHYSIOLOGY)
Stress-induced enhancement of the startle reflex
[AD-A278414] p 237 N94-33327

EXOBIOLOGY
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 388)
[NASA-SP-7011(388)] p 229 N94-31414
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 389)
[NASA-SP-7011(389)] p 231 N94-32347
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 385)
[NASA-SP-7011(385)] p 231 N94-32348

EXTRATERRESTRIAL INTELLIGENCE
The quest for contact
[NASA-TM-109778] p 241 N94-32389

EXTRAVEHICULAR ACTIVITY
The Nomad Explorer assembly assist vehicle: An architecture for rapid global extraterrestrial base infrastructure establishment p 237 N94-31429

EYE MOVEMENTS
Analysis of pursuit tracking eye movements in pilots and nonfliers
[AD-A276597] p 233 N94-32035

F

FATIGUE (BIOLOGY)
Effects of methamphetamine and fatigue on long- and short-term memory
[AD-A276452] p 234 N94-32187

FEAR
Stress-induced enhancement of the startle reflex
[AD-A278414] p 237 N94-33327

FIELD EFFECT TRANSISTORS
Perspectives of glucose sensing based on a charge-modulating competition reaction
[ISBN-9-09-005754-4] p 229 N94-31652

FINGERS
Numerical model of the thermal behavior of an extremity in a cold environment including counter-current heat exchange between the blood vessels
[AD-A278099] p 232 N94-33040

FLIGHT CLOTHING
Aircrew Eye/Respiratory Protection (AERP): 16-hour extended wear evaluation of chemical protective equipment
[AD-A277288] p 240 N94-32609

FLIGHT CONTROL
Investigation of drive-reinforcement learning and application of learning to flight control
[AD-A277442] p 236 N94-33053

FLIGHT CREWS
Unit specific crew rest strategies: Phase 1 evaluation of the 1/212th Aviation Battalion during shiftwork transitions
[AD-A277122] p 239 N94-32379

FLOW RESISTANCE
Effects of combined breathing impediments on diver's respiratory performance
[AD-A277437] p 240 N94-33084

FLUORESCENCE
Noninvasive spectroscopic diagnosis of superficial ocular lesions and corneal infections
[DE94-006231] p 232 N94-32732
Development of a video fluorescence system for assessing burn depth
[AD-A278127] p 232 N94-33092

FOOD PROCESSING
Novel ultrasonic method for food hydration
[AD-A277411] p 239 N94-32580

FOURIER TRANSFORMATION
An experimental study of pilot/vehicle dynamics using a tilt rotor flying machine
[AD-A277516] p 241 N94-33349

FUNCTIONAL DESIGN SPECIFICATIONS
Development of a video fluorescence system for assessing burn depth
[AD-A278127] p 232 N94-33092

FUSELAGES
An experimental study of pilot/vehicle dynamics using a tilt rotor flying machine
[AD-A277516] p 241 N94-33349

G

GENETIC ALGORITHMS
A genetic algorithm based method for docking flexible molecules
[DE94-007525] p 227 N94-32269

GLUCOSE
Perspectives of glucose sensing based on a charge-modulating competition reaction
[ISBN-9-09-005754-4] p 229 N94-31652

GOGGLES
Methods for measuring characteristics of night vision goggles
[AD-A277046] p 239 N94-32302

GRAPHICAL USER INTERFACE
The role of guideline-based design tools
[DE94-007482] p 240 N94-32596

H

HAND (ANATOMY)
Digit-Eyes: Vision-based human hand tracking
[NASA-CR-195913] p 237 N94-31447

HEAT FLUX
Errors associated with the use of heat flow transducers p 230 N94-31742

HEAT GENERATION
Numerical model of the thermal behavior of an extremity in a cold environment including counter-current heat exchange between the blood vessels
[AD-A278099] p 232 N94-33040

HEAT MEASUREMENT
Errors associated with the use of heat flow transducers p 230 N94-31742

HEAT TRANSFER
Numerical model of the thermal behavior of an extremity in a cold environment including counter-current heat exchange between the blood vessels
[AD-A278099] p 232 N94-33040

HELICOPTERS
Evaluation of intensity distribution profiles for US. Army rotorcraft position lighting adapted for image intensifier operations
[AD-A276459] p 238 N94-32171

HIBERNATION
Characterization and utilization of opiate-like hibernation factors
[AD-A278136] p 229 N94-33098

HIGH ALTITUDE
Medical problems in high mountain environments. A handbook for medical officers
[AD-A278095] p 233 N94-33268

HUMAN BEHAVIOR
An experimental study of pilot/vehicle dynamics using a tilt rotor flying machine
[AD-A277516] p 241 N94-33349

HUMAN BODY
Minutes: Accredited Standards Committee on Bioacoustics, S3. US TAG for ISO/TC 43, acoustics, IEC/TC 29 electroacoustics, and ISO/TC 108/SC4 human exposure to mechanical vibration and shock
[AD-A276201] p 229 N94-31490
Virtual reality in medical education and assessment
p 231 N94-32471

HUMAN FACTORS ENGINEERING
THE VERTICAL p 239 N94-32435
The role of guideline-based design tools
[DE94-007482] p 240 N94-32596
Aircrew Eye/Respiratory Protection (AERP): 16-hour extended wear evaluation of chemical protective equipment
[AD-A277288] p 240 N94-32609
Use of a pitch adjustable foot restraint system: Operator strength capability and load requirements
[NASA-TP-3477] p 240 N94-33050
Cockpit Electronic Display Workshop: Proceedings (computer diskette)
[AD-M000330] p 241 N94-33171

HUMAN PERFORMANCE
Development and enhancement of a model of performance and decision making under stress in a real life setting
[AD-A276029] p 233 N94-31440
Effects of methamphetamine and fatigue on long- and short-term memory
[AD-A276452] p 234 N94-32187

HUMAN TOLERANCES
Review of pharmacological approach to improve cold tolerance p 230 N94-31740
Lipid metabolism in cold-exposed humans
p 230 N94-31741
Numerical model of the thermal behavior of an extremity in a cold environment including counter-current heat exchange between the blood vessels
[AD-A278099] p 232 N94-33040

HUMAN-COMPUTER INTERFACE
Digit-Eyes: Vision-based human hand tracking
[NASA-CR-195913] p 237 N94-31447
Beyond the read-eval loop: The artifacts system
[AD-A276589] p 238 N94-32034
THE VERTICAL p 239 N94-32435
The role of guideline-based design tools
[DE94-007482] p 240 N94-32596

HYPERBARIC CHAMBERS
Effects of combined breathing impediments on diver's respiratory performance
[AD-A277437] p 240 N94-33084

HYPOTHERMIA
Validation and sensitivity analysis of Texas human thermal model predictions during cold water immersion
[AD-A275240] p 231 N94-32156

I

ILLUMINATING
Evaluation of intensity distribution profiles for US. Army rotorcraft position lighting adapted for image intensifier operations
[AD-A276459] p 238 N94-32171

IMAGE CLASSIFICATION
A differential theory of learning for efficient statistical pattern recognition
[AD-A277313] p 234 N94-32277

IMAGE INTENSIFIERS
Evaluation of intensity distribution profiles for US. Army rotorcraft position lighting adapted for image intensifier operations
[AD-A276459] p 238 N94-32171

IMAGE PROCESSING
Fast nonsupervised 3D registration of PET and MR images of the brain
[TELECOM-93-C-006] p 232 N94-33069

IMAGING TECHNIQUES
Fast nonsupervised 3D registration of PET and MR images of the brain
[TELECOM-93-C-006] p 232 N94-33069

IMPLANTED ELECTRODES (BIOLOGY)
Perspectives of glucose sensing based on a charge-modulating competition reaction
[ISBN-9-09-005754-4] p 229 N94-31652
Neostriatal neuronal activity and behavior
[AD-A278429] p 237 N94-33333

INDEXES (DOCUMENTATION)
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 388)
[NASA-SP-7011(388)] p 229 N94-31414

INDUSTRIAL SAFETY
Systems for the monitoring of working conditions relating to health and safety: Extensive description. Norway
[PB94-138542] p 238 N94-31839

INFECTIOUS DISEASES
Noninvasive spectroscopic diagnosis of superficial ocular lesions and corneal infections
[DE94-006231] p 232 N94-32732
INFERENCE
Reading: Interaction with memory
[AD-A277547] p 235 N94-32956
INFORMATION PROCESSING (BIOLOGY)
Sensory sensitivities and discriminations and their roles in aviation
[AD-A277312] p 234 N94-32276
Reading: Interaction with memory
[AD-A277547] p 235 N94-32956
Workshop on Visual Perception: Computation and Psychophysics
[AD-A278412] p 236 N94-33326
INFORMATION SYSTEMS
Systems for the monitoring of working conditions relating to health and safety: Extensive description. Norway
[PB94-138542] p 238 N94-31839
INFORMATION THEORY
Information theory for arm visuo-motor coordination
p 235 N94-32495
INHOMOGENEITY
Spectral inhomogeneity of the bacterial light-harvesting antennae: Causes and consequences
[ETN-94-96020] p 227 N94-31533
INJURIES
THE VERTICAL p 239 N94-32435

K

KINEMATICS
Information theory for arm visuo-motor coordination
p 235 N94-32495

L

LAGRANGIAN FUNCTION
An experimental study of pilot/vehicle dynamics using a tilt rotor flying machine
[AD-A277516] p 241 N94-33349
LASER APPLICATIONS
Development of a video fluorescence system for assessing burn depth
[AD-A278127] p 232 N94-33092
LEARNING
Reminding-based learning
[AD-A277424] p 236 N94-32997
LIFE SCIENCES
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 388)
[NASA-SP-7011(388)] p 229 N94-31414
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 389)
[NASA-SP-7011(389)] p 231 N94-32347
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 385)
[NASA-SP-7011(385)] p 231 N94-32348
LIFE SUPPORT SYSTEMS
Design of a logistics model for building and supporting a lunar station
[ILR-MITT-282(1993)] p 238 N94-31852
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 389)
[NASA-SP-7011(389)] p 231 N94-32347
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 385)
[NASA-SP-7011(385)] p 231 N94-32348
Catalytic methods using molecular oxygen for treatment of PMMS and ECLSS waste streams, volume 2
[NASA-CR-190299] p 240 N94-32697
Characterization and utilization of opiate-like hibernation factors
[AD-A278136] p 229 N94-33098
LIGANDS
A genetic algorithm based method for docking flexible molecules
[DE94-007525] p 227 N94-32269
LIGNIN
Towards a detailed understanding of the structural variability in lignins: A new approach
[DE94-007449] p 227 N94-32267
LIPID METABOLISM
Lipid metabolism in cold-exposed humans
p 230 N94-31741
LIQUID CRYSTALS
Thermotropic liquid crystals: A variable Clo material
p 238 N94-31739
LOGISTICS
The Nomad Explorer assembly assist vehicle: An architecture for rapid global extraterrestrial base infrastructure establishment p 237 N94-31429
LUMINOUS INTENSITY
Evaluation of intensity distribution profiles for US. Army rotorcraft position lighting adapted for image intensifier operations
[AD-A276459] p 238 N94-32171
LUNAR BASES
The Nomad Explorer assembly assist vehicle: An architecture for rapid global extraterrestrial base infrastructure establishment p 237 N94-31429
Design of a logistics model for building and supporting a lunar station
[ILR-MITT-282(1993)] p 238 N94-31852
LUNAR EXPLORATION
The Nomad Explorer assembly assist vehicle: An architecture for rapid global extraterrestrial base infrastructure establishment p 237 N94-31429
LUNAR LOGISTICS
Design of a logistics model for building and supporting a lunar station
[ILR-MITT-282(1993)] p 238 N94-31852
LUNAR SURFACE
The Nomad Explorer assembly assist vehicle: An architecture for rapid global extraterrestrial base infrastructure establishment p 237 N94-31429
LUNGS
Effects of combined breathing impediments on diver's respiratory performance
[AD-A277437] p 240 N94-33084

M

MACHINE LEARNING
A differential theory of learning for efficient statistical pattern recognition
[AD-A277313] p 234 N94-32277
Investigation of drive-reinforcement learning and application of learning to flight control
[AD-A277442] p 236 N94-33053
MAGNESIUM
The magnesium chelation step in chlorophyll biosynthesis
[DE94-008727] p 228 N94-32690
MAGNETIC RESONANCE
Fast nonsupervised 3D registration of PET and MR images of the brain
[TELECOM-93-C-006] p 232 N94-33069
MAN MACHINE SYSTEMS
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 389)
[NASA-SP-7011(389)] p 231 N94-32347
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 385)
[NASA-SP-7011(385)] p 231 N94-32348
Technology transfer of operator-in-the-loop simulation
p 235 N94-32472
MANIPULATORS
Technology transfer of operator-in-the-loop simulation
p 235 N94-32472
MATCHING
Fast nonsupervised 3D registration of PET and MR images of the brain
[TELECOM-93-C-006] p 232 N94-33069
MATHEMATICAL MODELS
Fast nonsupervised 3D registration of PET and MR images of the brain
[TELECOM-93-C-006] p 232 N94-33069
MAXIMUM LIKELIHOOD ESTIMATES
An experimental study of pilot/vehicle dynamics using a tilt rotor flying machine
[AD-A277516] p 241 N94-33349
MEDICAL PERSONNEL
Medical problems in high mountain environments. A handbook for medical officers
[AD-A278095] p 233 N94-33268
MEDICAL SCIENCE
Virtual reality in medical education and assessment
p 231 N94-32471
MEMORY
Effects of methamphetamine and fatigue on long- and short-term memory
[AD-A276452] p 234 N94-32187
Reading: Interaction with memory
[AD-A277547] p 235 N94-32956
Reminding-based learning
[AD-A277424] p 236 N94-32997
METABOLISM
The organization of the suprachiasmatic circadian pacemaker of the rat and its regulation by neurotransmitters and modulators
[AD-A277324] p 228 N94-32622
Numerical model of the thermal behavior of an extremity in a cold environment including counter-current heat exchange between the blood vessels
[AD-A278099] p 232 N94-33040
METHAMPHETAMINE
Effects of methamphetamine and fatigue on long- and short-term memory
[AD-A276452] p 234 N94-32187
MILITARY OPERATIONS
Medical problems in high mountain environments. A handbook for medical officers
[AD-A278095] p 233 N94-33268
MOLECULAR BIOLOGY
Future directions of nonlinear dynamics in physical and biological systems. (Physica D nonlinear, volume 68, number 1)
[AD-A278085] p 229 N94-33250
MOLECULAR DYNAMICS
Future directions of nonlinear dynamics in physical and biological systems. (Physica D nonlinear, volume 68, number 1)
[AD-A278085] p 229 N94-33250
MOLECULAR STRUCTURE
Towards a detailed understanding of the structural variability in lignins: A new approach
[DE94-007449] p 227 N94-32267
MOLECULES
A genetic algorithm based method for docking flexible molecules
[DE94-007525] p 227 N94-32269
MOTION PERCEPTION
Sensory sensitivities and discriminations and their roles in aviation
[AD-A277312] p 234 N94-32276
MOTION SICKNESS
Autogenic-feedback training as a treatment for airsickness in high-performance military aircraft: Two case studies
[NASA-TM-108810] p 236 N94-33068
MOUNTAINS
Medical problems in high mountain environments. A handbook for medical officers
[AD-A278095] p 233 N94-33268
MUSCLES
Muscle disuse through tail-suspension: Etiology and therapeutics p 230 N94-31746
MUSCULOSKELETAL SYSTEM
Isolating strain parameters correlated to skeletal adaptation p 231 N94-31960

N

NEUROLOGY
Visual neural development and chromatic aberration
[AD-A277402] p 234 N94-32345
NEURONS
The organization of the suprachiasmatic circadian pacemaker of the rat and its regulation by neurotransmitters and modulators
[AD-A277324] p 228 N94-32622
Models of the neuronal mechanisms of target localization of the barn owl
[AD-A277332] p 232 N94-32623
Neostriatal neuronal activity and behavior
[AD-A278429] p 237 N94-33333
NEUROPHYSIOLOGY
Models of the neuronal mechanisms of target localization of the barn owl
[AD-A277332] p 232 N94-32623
Neostriatal neuronal activity and behavior
[AD-A278429] p 237 N94-33333
NEUROTRANSMITTERS
The organization of the suprachiasmatic circadian pacemaker of the rat and its regulation by neurotransmitters and modulators
[AD-A277324] p 228 N94-32622
NIGHT VISION
Methods for measuring characteristics of night vision goggles
[AD-A277046] p 239 N94-32302
NOISE (SOUND)
An investigation of acoustic noise requirements for the Space Station centrifuge facility
[NASA-TM-108811] p 240 N94-32936
NOISE REDUCTION
An investigation of acoustic noise requirements for the Space Station centrifuge facility
[NASA-TM-108811] p 240 N94-32936
NONLINEAR OPTICS
Future directions of nonlinear dynamics in physical and biological systems. (Physica D nonlinear, volume 68, number 1)
[AD-A278085] p 229 N94-33250
NONLINEAR SYSTEMS
Investigation of drive-reinforcement learning and application of learning to flight control
[AD-A277442] p 236 N94-33053

000020

Future directions of nonlinear dynamics in physical and biological systems. (Physica D nonlinear, volume 68, number 1)
[AD-A278085] p 229 N94-33250

NUCLEI (CYTOLOGY)
Stress-induced enhancement of the startle reflex
[AD-A278414] p 237 N94-33327

O

OBSTACLE AVOIDANCE
Tripping over obstacles: Biomechanical analyses of how young and old try to avoid it p 236 N94-31954

OPERATOR PERFORMANCE
Use of a pitch adjustable foot restraint system: Operator strength capability and load requirements
[NASA-TP-3477] p 240 N94-33050

OPTICAL MEASUREMENT
Methods for measuring characteristics of night vision goggles
[AD-A277046] p 239 N94-32302

OPTICAL TRACKING
Digit-Eyes: Vision-based human hand tracking
[NASA-CR-195913] p 237 N94-31447

OPTIMAL CONTROL
Investigation of drive-reinforcement learning and application of learning to flight control
[AD-A277442] p 236 N94-33053

ORBITAL WORKERS
Use of a pitch adjustable foot restraint system: Operator strength capability and load requirements
[NASA-TP-3477] p 240 N94-33050

ORGANIC MATERIALS
Development and application of photosensitive device systems to studies of biological and organic materials
[DE94-008503] p 228 N94-32516

ORGANISMS
Light utilization and photoinhibition of photosynthesis in marine phytoplankton
[DE94-005505] p 228 N94-32896

OXIDATION
Catalytic methods using molecular oxygen for treatment of PMMS and ECLSS waste streams, volume 2
[NASA-CR-190299] p 240 N94-32697

P

PATTERN RECOGNITION
Digit-Eyes: Vision-based human hand tracking
[NASA-CR-195913] p 237 N94-31447
A differential theory of learning for efficient statistical pattern recognition
[AD-A277213] p 234 N94-32277
Mechanisms of temporal pattern discrimination by human observers
[AD-A277407] p 235 N94-32577

PATTERN REGISTRATION
Fast nonsupervised 3D registration of PET and MR images of the brain
[TELECOM-93-C-006] p 232 N94-33069

PERFORMANCE TESTS
Aircrew Eye/Respiratory Protection (AERP): 16-hour extended wear evaluation of chemical protective equipment
[AD-A277288] p 240 N94-32609

PERIPHERAL EQUIPMENT (COMPUTERS)
THE VERTICAL p 239 N94-32435

PHARMACOLOGY
Review of pharmacological approach to improve cold tolerance p 230 N94-31740

PHOTOSYNTHESIS
Spectral inhomogeneity of the bacterial light-harvesting antennae: Causes and consequences
[ETN-94-96020] p 227 N94-31533
Light utilization and photoinhibition of photosynthesis in marine phytoplankton
[DE94-005505] p 228 N94-32896

PHYSIOLOGICAL EFFECTS
Review of pharmacological approach to improve cold tolerance p 230 N94-31740
Muscle disuse through tail-suspension: Etiology and therapeutics p 230 N94-31748
Characterization and utilization of opiate-like hibernation factors
[AD-A278136] p 229 N94-33098

PHYSIOLOGICAL RESPONSES
Isolating strain parameters correlated to skeletal adaptation p 231 N94-31960
Autogenic-feedback training as a treatment for airsickness in high-performance military aircraft: Two case studies
[NASA-TM-108810] p 236 N94-33068

PHYSIOLOGICAL TESTS
Tripping over obstacles: Biomechanical analyses of how young and old try to avoid it p 236 N94-31954

PHYTOPLANKTON
Light utilization and photoinhibition of photosynthesis in marine phytoplankton
[DE94-005505] p 228 N94-32896

PILOT TRAINING
Autogenic-feedback training as a treatment for airsickness in high-performance military aircraft: Two case studies
[NASA-TM-108810] p 236 N94-33068

PIVOTS
An experimental study of pilot/vehicle dynamics using a tilt rotor flying machine
[AD-A277516] p 241 N94-33349

PLANKTON
Light utilization and photoinhibition of photosynthesis in marine phytoplankton
[DE94-005505] p 228 N94-32896

PLANTS (BOTANY)
Ninth International Workshop on Plant Membrane Biology
[DE94-005690] p 228 N94-32769

POPULATION THEORY
On the reciprocal relationship between life histories and population dynamics
[CWI-AM-R9302] p 227 N94-32226

POPULATIONS
On the reciprocal relationship between life histories and population dynamics
[CWI-AM-R9302] p 227 N94-32226

POSITION SENSING
Digit-Eyes: Vision-based human hand tracking
[NASA-CR-195913] p 237 N94-31447

PROBABILITY THEORY
Visual processing of object velocity and acceleration
[AD-A277425] p 236 N94-32998

PROBLEM SOLVING
Reminding-based learning
[AD-A277424] p 236 N94-32997

PROJECT SETI
The quest for contact
[NASA-TM-109778] p 241 N94-32389

PROKARYOTES
Light utilization and photoinhibition of photosynthesis in marine phytoplankton
[DE94-005505] p 228 N94-32896

PROTECTIVE CLOTHING
Proceedings of the DCIEM Diver Thermal Protection Workshop
[DCIEM-92-10] p 230 N94-31738
Thermotropic liquid crystals: A variable Clo material p 238 N94-31739
Validation and sensitivity analysis of Texas human thermal model predictions during cold water immersion
[AD-A275240] p 231 N94-32156
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 389)
[NASA-SP-7011(389)] p 231 N94-32347
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 385)
[NASA-SP-7011(385)] p 231 N94-32348
Aircrew Eye/Respiratory Protection (AERP): 16-hour extended wear evaluation of chemical protective equipment
[AD-A277288] p 240 N94-32609

PROTEINS
A genetic algorithm based method for docking flexible molecules
[DE94-007525] p 227 N94-32269
Development and application of photosensitive device systems to studies of biological and organic materials
[DE94-008503] p 228 N94-32516
The magnesium chelation step in chlorophyll biosynthesis
[DE94-008727] p 228 N94-32890

PSYCHOPHYSICS
Sensory sensitivities and discriminations and their roles in aviation
[AD-A277312] p 234 N94-32276
Visual encoding of spatial relations
[AD-A277400] p 234 N94-32344
Workshop on Visual Perception: Computation and Psychophysics
[AD-A278412] p 236 N94-33326

PSYCHOPHYSIOLOGY
Determination of multiple sound sources
[AD-A277379] p 233 N94-32096
From animals to animats
[AD-A277427] p 236 N94-33241

PUBLIC HEALTH
Systems for the monitoring of working conditions relating to health and safety: Extensive description. Norway
[PB94-138542] p 238 N94-31839

PULMONARY FUNCTIONS
Medical problems in high mountain environments. A handbook for medical officers
[AD-A278095] p 233 N94-33268

PURSUIT TRACKING
Analysis of pursuit tracking eye movements in pilots and nonfliers
[AD-A276597] p 233 N94-32035

R

RADIO TELESCOPES
The quest for contact
[NASA-TM-109778] p 241 N94-32389

READING
Reading: Interaction with memory
[AD-A277547] p 235 N94-32956

REAL TIME OPERATION
An experimental study of pilot/vehicle dynamics using a tilt rotor flying machine
[AD-A277516] p 241 N94-33349

REFLEXES
Analysis of pursuit tracking eye movements in pilots and nonfliers
[AD-A276597] p 233 N94-32035

REMOTE CONTROL
Technology transfer of operator-in-the-loop simulation p 235 N94-32472

REPRODUCTION (BIOLOGY)
The legacy of Kermack and McKendrick
[CWI-AM-R9304] p 227 N94-32228

RESPIRATION
Effects of combined breathing impediments on diver's respiratory performance
[AD-A277437] p 240 N94-33084
Characterization and utilization of opiate-like hibernation factors
[AD-A278136] p 229 N94-33098

ROBOT ARMS
Information theory for arm visuo-motor coordination p 235 N94-32495

ROBOT CONTROL
Information theory for arm visuo-motor coordination p 235 N94-32495

ROBOTS
From animals to animats
[AD-A277427] p 236 N94-33241

ROTATING ENVIRONMENTS
Autogenic-feedback training as a treatment for airsickness in high-performance military aircraft: Two case studies
[NASA-TM-108810] p 236 N94-33068

ROTATION
Unit specific crew rest strategies: Phase 1 evaluation of the 1/212th Aviation Battalion during shiftwork transitions
[AD-A277122] p 239 N94-32379

S

SAFETY
Systems for the monitoring of working conditions relating to health and safety: Extensive description. Norway
[PB94-138542] p 238 N94-31839

SCHEDULES
Unit specific crew rest strategies: Phase 1 evaluation of the 1/212th Aviation Battalion during shiftwork transitions
[AD-A277122] p 239 N94-32379

SCIENTIFIC VISUALIZATION
Virtual reality in medical education and assessment p 231 N94-32471

SENSORIMOTOR PERFORMANCE
Tripping over obstacles: Biomechanical analyses of how young and old try to avoid it p 236 N94-31954
Information theory for arm visuo-motor coordination p 235 N94-32495

SENSORY DISCRIMINATION
Mechanisms of temporal pattern discrimination by human observers
[AD-A277407] p 235 N94-32577

SHAPES
Visual encoding of spatial relations
[AD-A277400] p 234 N94-32344
Visual neural development and chromatic aberration
[AD-A277402] p 234 N94-32345

SIGNAL DETECTION
Auditory perception
[AD-A277414] p 234 N94-32419
Mechanisms of temporal pattern discrimination by human observers
[AD-A277407] p 235 N94-32577

SKIN (ANATOMY)
Development of a video fluorescence system for assessing burn depth
[AD-A278127] p 232 N94-33092
SKIN TEMPERATURE (BIOLOGY)
Errors associated with the use of heat flow transducers p 230 N94-31742
SLEEP
Unit specific crew rest strategies: Phase 1 evaluation of the 1/212th Aviation Battalion during shiftwork transitions
[AD-A277122] p 239 N94-32379
SLEEP DEPRIVATION
Effects of methamphetamine and fatigue on long- and short-term memory
[AD-A276452] p 234 N94-32187
SOFTWARE ENGINEERING
The role of guideline-based design tools
[DE94-007482] p 240 N94-32596
SOLITARY WAVES
Future directions of nonlinear dynamics in physical and biological systems. (Physica D nonlinear, volume 68, number 1)
[AD-A278085] p 229 N94-33250
SOUND WAVES
Auditory perception
[AD-A277414] p 234 N94-32419
SPACE MAINTENANCE
Use of a pitch adjustable foot restraint system: Operator strength capability and load requirements
[NASA-TP-3477] p 240 N94-33050
SPACE PERCEPTION
Sensory sensitivities and discriminations and their roles in aviation
[AD-A277312] p 234 N94-32276
Visual neural development and chromatic aberration
[AD-A277402] p 234 N94-32345
SPACE STATION FREEDOM
Catalytic methods using molecular oxygen for treatment of PMMS and ECLSS waste streams, volume 2
[NASA-CR-190299] p 240 N94-32697
An investigation of acoustic noise requirements for the Space Station centrifuge facility
[NASA-TM-108811] p 240 N94-32936
SPACE TRANSPORTATION
Design of a logistics model for building and supporting a lunar station
[ILR-MITT-282(1993)] p 238 N94-31852
SPATIAL DISTRIBUTION
Visual encoding of spatial relations
[AD-A277400] p 234 N94-32344
SPECTRUM ANALYSIS
Noninvasive spectroscopic diagnosis of superficial ocular lesions and corneal infections
[DE94-006231] p 232 N94-32732
STANDARDS
Minutes: Accredited Standards Committee on Bioacoustics, S3. US TAG for ISO/TC 43, acoustics, IEC/TC 29 electroacoustics, and ISO/TC 108/SC4 human exposure to mechanical vibration and shock
[AD-A276201] p 229 N94-31490
STIMULANTS
Effects of methamphetamine and fatigue on long- and short-term memory
[AD-A276452] p 234 N94-32187
STRAIN DISTRIBUTION
Isolating strain parameters correlated to skeletal adaptation p 231 N94-31960
STRAIN RATE
Isolating strain parameters correlated to skeletal adaptation p 231 N94-31960
STRESS (PHYSIOLOGY)
Muscle disuse through tail-suspension: Etiology and therapeutics p 230 N94-31746
STRESS (PSYCHOLOGY)
Development and enhancement of a model of performance and decision making under stress in a real life setting
[AD-A276029] p 233 N94-31440
Stress-induced enhancement of the startle reflex
[AD-A278414] p 237 N94-33327
SUNLIGHT
Spectral inhomogeneity of the bacterial light-harvesting antennae: Causes and consequences
[ETN-94-98020] p 227 N94-31533
SUPERCONDUCTING DEVICES
Future directions of nonlinear dynamics in physical and biological systems. (Physica D nonlinear, volume 68, number 1)
[AD-A278085] p 229 N94-33250
SURFACE PROPERTIES
Visual neural development and chromatic aberration
[AD-A277402] p 234 N94-32345
SYNTHESIS (CHEMISTRY)
Towards a detailed understanding of the structural variability in lignins: A new approach
[DE94-007449] p 227 N94-32267

T

TARGET ACQUISITION
Visual processing of object velocity and acceleration
[AD-A277425] p 236 N94-32998
TASK PLANNING (ROBOTICS)
Advanced teleoperation: Technology innovations and applications p 239 N94-32453
TECHNOLOGY UTILIZATION
Advanced teleoperation: Technology innovations and applications p 239 N94-32453
TELECOMMUNICATION
The Nomad Explorer assembly assist vehicle: An architecture for rapid global extraterrestrial base infrastructure establishment p 237 N94-31429
TELEOPERATORS
Advanced teleoperation: Technology innovations and applications p 239 N94-32453
Technology transfer of operator-in-the-loop simulation p 235 N94-32472
TELEROBOTICS
Advanced teleoperation: Technology innovations and applications p 239 N94-32453
Technology transfer of operator-in-the-loop simulation p 235 N94-32472
TEMPERATURE EFFECTS
Numerical model of the thermal behavior of an extremity in a cold environment including counter-current heat exchange between the blood vessels
[AD-A278099] p 232 N94-33040
THERMAL INSULATION
Proceedings of the DCIEM Diver Thermal Protection Workshop
[DCIEM-92-10] p 230 N94-31738
Thermotropic liquid crystals: A variable Clo material p 238 N94-31739
THERMAL PROTECTION
Proceedings of the DCIEM Diver Thermal Protection Workshop
[DCIEM-92-10] p 230 N94-31738
Thermotropic liquid crystals: A variable Clo material p 238 N94-31739
THERMAL STRESSES
Validation and sensitivity analysis of Texas human thermal model predictions during cold water immersion
[AD-A275240] p 231 N94-32156
THREE DIMENSIONAL MODELS
Fast nonsupervised 3D registration of PET and MR images of the brain
[TELECOM-93-C-006] p 232 N94-33069
TILT ROTOR AIRCRAFT
An experimental study of pilot/vehicle dynamics using a tilt rotor flying machine
[AD-A277516] p 241 N94-33349
TIME DISCRIMINATION
Mechanisms of temporal pattern discrimination by human observers
[AD-A277407] p 235 N94-32577
TRAJECTORIES
Visual processing of object velocity and acceleration
[AD-A277425] p 236 N94-32998
TRANSDUCERS
Errors associated with the use of heat flow transducers p 230 N94-31742

U

ULTRASONIC AGITATION
Novel ultrasonic method for food hydration
[AD-A277411] p 239 N94-32580
ULTRASONICS
Novel ultrasonic method for food hydration
[AD-A277411] p 239 N94-32580
UNDERWATER PHYSIOLOGY
Proceedings of the DCIEM Diver Thermal Protection Workshop
[DCIEM-92-10] p 230 N94-31738

V

VESTIBULAR TESTS
Model-based scientific discovery: A study in space bioengineering p 233 N94-31990
VIDEO EQUIPMENT
Development of a video fluorescence system for assessing burn depth
[AD-A278127] p 232 N94-33092
VIRTUAL REALITY
Virtual reality in medical education and assessment p 231 N94-32471
VISION
Sensory sensitivities and discriminations and their roles in aviation
[AD-A277312] p 234 N94-32276
Workshop on Visual Perception: Computation and Psychophysics
[AD-A278412] p 236 N94-33326
VISUAL CONTROL
Technology transfer of operator-in-the-loop simulation p 235 N94-32472
VISUAL DISCRIMINATION
Sensory sensitivities and discriminations and their roles in aviation
[AD-A277312] p 234 N94-32276
VISUAL PERCEPTION
Analysis of pursuit tracking eye movements in pilots and nonfliers
[AD-A278597] p 233 N94-32035
Visual encoding of spatial relations
[AD-A277400] p 234 N94-32344
Visual neural development and chromatic aberration
[AD-A277402] p 234 N94-32345
Information theory for arm visuo-motor coordination p 235 N94-32495
Mechanisms of temporal pattern discrimination by human observers
[AD-A277407] p 235 N94-32577
Models of the neuronal mechanisms of target localization of the barn owl
[AD-A277332] p 232 N94-32623
Visual processing of object velocity and acceleration
[AD-A277425] p 236 N94-32998
Workshop on Visual Perception: Computation and Psychophysics
[AD-A278412] p 236 N94-33326
VISUAL SIGNALS
Visual processing of object velocity and acceleration
[AD-A277425] p 236 N94-32998

W

WALKING
Tripping over obstacles: Biomechanical analyses of how young and old try to avoid it p 238 N94-31954
WASTE WATER
Catalytic methods using molecular oxygen for treatment of PMMS and ECLSS waste streams, volume 2
[NASA-CR-190299] p 240 N94-32697
WATER IMMERSION
Validation and sensitivity analysis of Texas human thermal model predictions during cold water immersion
[AD-A275240] p 231 N94-32156
WATER RECLAMATION
Catalytic methods using molecular oxygen for treatment of PMMS and ECLSS waste streams, volume 2
[NASA-CR-190299] p 240 N94-32697
WATER TREATMENT
Catalytic methods using molecular oxygen for treatment of PMMS and ECLSS waste streams, volume 2
[NASA-CR-190299] p 240 N94-32697
WEIGHTLESSNESS
Muscle disuse through tail-suspension: Etiology and therapeutics p 230 N94-31746
WORKLOADS (PSYCHOPHYSIOLOGY)
Unit specific crew rest strategies: Phase 1 evaluation of the 1/212th Aviation Battalion during shiftwork transitions
[AD-A277122] p 239 N94-32379

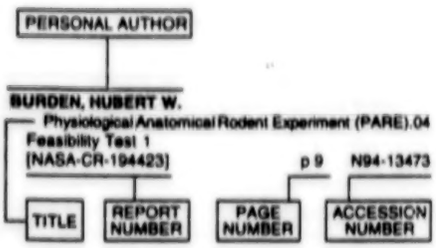
X

X RAY DETECTORS
Development and application of photosensitive device systems to studies of biological and organic materials
[DE94-008503] p 228 N94-32518

000021

000022

Typical Personal Author Index Listing



Listings in this index are arranged alphabetically by personal author. The title of the document is used to provide a brief description of the subject matter. The report number helps to indicate the type of document (e.g., NASA report, translation, NASA contractor report). The page and accession numbers are located beneath and to the right of the title. Under any one author's name the accession numbers are arranged in sequence.

A

AKSE, JAMES R.
Catalytic methods using molecular oxygen for treatment of PMMS and ECLSS waste streams, volume 2
[NASA-CR-190299] p 240 N94-32697

ALBERT, STEPHEN L.
THE VERTICAL p 239 N94-32435

ALLAN, LAWRENCE W.
Unit specific crew rest strategies: Phase 1 evaluation of the 1/212th Aviation Battalion during shiftwork transitions
[AD-A277122] p 239 N94-32379

ATKINS, STEPHEN C.
Investigation of drive-reinforcement learning and application of learning to flight control
[AD-A277442] p 236 N94-33053

B

BAIRD, LEEMON C., III
Investigation of drive-reinforcement learning and application of learning to flight control
[AD-A277442] p 236 N94-33053

BAKER, WALTER L.
Investigation of drive-reinforcement learning and application of learning to flight control
[AD-A277442] p 236 N94-33053

BEJCZY, ANTAL K.
Advanced teleoperation: Technology innovations and applications p 239 N94-32453

BELL, ANN F.
Analysis of pursuit tracking eye movements in pilots and nonfliers
[AD-A276597] p 233 N94-32035

BELL, BRAD
Virtual reality in medical education and assessment p 231 N94-32471

BENDRIEM, BERNARD
Fast nonsupervised 3D registration of PET and MR images of the brain
[TELECOM-93-C-006] p 232 N94-33069

BIGGERS, RAND R.
Thermotropic liquid crystals: A variable Clo material p 238 N94-31739

BIGIO, I. J.
Noninvasive spectroscopic diagnosis of superficial ocular lesions and corneal infections
[DE94-006231] p 232 N94-32732

BLOCH, ISABELLE
Fast nonsupervised 3D registration of PET and MR images of the brain
[TELECOM-93-C-006] p 232 N94-33069

BUA, DOMINIC
Development of a video fluorescence system for assessing burn depth
[AD-A278127] p 232 N94-33092

BURBECK, CHRISTINA A.
Visual encoding of spatial relations
[AD-A277400] p 234 N94-32344

C

CASTELLANO, TIMOTHY
An investigation of acoustic noise requirements for the Space Station centrifuge facility
[NASA-TM-108811] p 240 N94-32936

CHEN, DONG
The organization of the suprachiasmatic circadian pacemaker of the rat and its regulation by neurotransmitters and modulators
[AD-A277324] p 228 N94-32622

CHEN, HSIEH-CHING
Tripping over obstacles: Biomechanical analyses of how young and old try to avoid it p 238 N94-31954

CHIARAMONTE, JAMES A.
Unit specific crew rest strategies: Phase 1 evaluation of the 1/212th Aviation Battalion during shiftwork transitions
[AD-A277122] p 239 N94-32379

CHRISTIANSEN, P. L.
Future directions of nonlinear dynamics in physical and biological systems. (Physica D nonlinear, volume 68, number 1)
[AD-A278085] p 229 N94-33250

COHEN, MARION F.
Auditory perception
[AD-A277414] p 234 N94-32419

COLBERT, MALCOLM N.
Evaluation of intensity distribution profiles for US. Army rotorcraft position lighting adapted for image intensifier operations
[AD-A276459] p 238 N94-32171

COMPERATORE, CARLOS A.
Unit specific crew rest strategies: Phase 1 evaluation of the 1/212th Aviation Battalion during shiftwork transitions
[AD-A277122] p 239 N94-32379

COWINGS, PATRICIA S.
Autogenic-feedback training as a treatment for airsickness in high-performance military aircraft: Two case studies
[NASA-TM-108810] p 236 N94-33066

CYMERMAN, ALLEN
Medical problems in high mountain environments. A handbook for medical officers
[AD-A278095] p 233 N94-33268

D

DAVIS, MICHAEL
Stress-induced enhancement of the startle reflex
[AD-A278414] p 237 N94-33327

DECAMPOS, TARCISIO PASSOS RIBEIRO
Information theory for arm visuo-motor coordination p 235 N94-32495

DEMARCO, STEVEN
The organization of the suprachiasmatic circadian pacemaker of the rat and its regulation by neurotransmitters and modulators
[AD-A277324] p 228 N94-32622

DIEKMANN, O.
The legacy of Kermack and McKendrick
[CWI-AM-R9304] p 227 N94-32228

DIEKMANN, ODO
On the reciprocal relationship between life histories and population dynamics
[CWI-AM-R9302] p 227 N94-32226

DING, JIAN
The organization of the suprachiasmatic circadian pacemaker of the rat and its regulation by neurotransmitters and modulators
[AD-A277324] p 228 N94-32622

DOMAN, DAVID B.
An experimental study of pilot/vehicle dynamics using a tilt rotor flying machine
[AD-A277516] p 241 N94-33349

DUCHARME, M. B.
Errors associated with the use of heat flow transducers p 230 N94-31742

DYE, RAYMOND
Determination of multiple sound sources
[AD-A277379] p 233 N94-32096

E

EILBECK, J. C.
Future directions of nonlinear dynamics in physical and biological systems. (Physica D nonlinear, volume 68, number 1)
[AD-A278085] p 229 N94-33250

ENDERLE, JACK D.
Analysis of pursuit tracking eye movements in pilots and nonfliers
[AD-A276597] p 233 N94-32035

ENGELKEN, EDWARD J.
Analysis of pursuit tracking eye movements in pilots and nonfliers
[AD-A276597] p 233 N94-32035

F

FAIMAN, LIA
The organization of the suprachiasmatic circadian pacemaker of the rat and its regulation by neurotransmitters and modulators
[AD-A277324] p 228 N94-32622

FALKOWSKI, P. G.
Light utilization and photoinhibition of photosynthesis in marine phytoplankton
[DE94-005505] p 228 N94-32896

FOX, J. A.
The role of guideline-based design tools
[DE94-007482] p 240 N94-32596

FRIM, J.
Errors associated with the use of heat flow transducers p 230 N94-31742

FRISCH, H. P.
Technology transfer of operator-in-the-loop simulation p 235 N94-32472

FROUIN, VINCENT
Fast nonsupervised 3D registration of PET and MR images of the brain
[TELECOM-93-C-006] p 232 N94-33069

G

GAYLES, ELLIS CALVIN
Muscle disuse through tail-suspension: Etiology and therapeutics p 230 N94-31746

GILLETTE, MARTHA U.
The organization of the suprachiasmatic circadian pacemaker of the rat and its regulation by neurotransmitters and modulators
[AD-A277324] p 228 N94-32622

GONZALES, RICHARD R.
Numerical model of the thermal behavior of an extremity in a cold environment including counter-current heat exchange between the blood vessels
[AD-A278099] p 232 N94-33040

GOZA, STEWART MICHAEL
Virtual reality in medical education and assessment p 231 N94-32471

000023

000023

GREENE, R.
Light utilization and photoinhibition of photosynthesis in marine phytoplankton
(DE94-005505) p 228 N94-32896

GRITZ, D. C.
Noninvasive spectroscopic diagnosis of superficial ocular lesions and corneal infections
(DE94-006231) p 232 N94-32732

GROLEAU, NICOLAS
Model-based scientific discovery: A study in space bioengineering p 233 N94-31990

GROSS, TED S.
Isolating strain parameters correlated to skeletal adaptation p 231 N94-31960

GRUNER, S. M.
Development and application of photosensitive device systems to studies of biological and organic materials
(DE94-008503) p 228 N94-32516

H

HAMPSHIRE, JOHN
A differential theory of learning for efficient statistical pattern recognition
(AD-A277313) p 234 N94-32277

HANSEN, J. C.
Novel ultrasonic method for food hydration
(AD-A277411) p 239 N94-32580

HARTMAN, RICHARD T.
Methods for measuring characteristics of night vision goggles
(AD-A277046) p 239 N94-32302

HEESTERBEEK, J. A. P.
The legacy of Kermack and McKendrick
(CWI-AM-R9304) p 227 N94-32226

HUHN, RICHARD
Design of a logistics model for building and supporting a lunar station
(ILR-MITT-282(1993)) p 238 N94-31852

J

JACOBS, I.
Review of pharmacological approach to improve cold tolerance p 230 N94-31740
Lipid metabolism in cold-exposed humans p 230 N94-31741

JAEGER, E. P.
A genetic algorithm based method for docking flexible molecules
(DE94-007525) p 227 N94-32269

JERATH, MAYA
Development of a video fluorescence system for assessing burn depth
(AD-A278127) p 232 N94-33092

JOHNSON, T.
Noninvasive spectroscopic diagnosis of superficial ocular lesions and corneal infections
(DE94-006231) p 232 N94-32732

JUDSON, R. S.
A genetic algorithm based method for docking flexible molecules
(DE94-007525) p 227 N94-32269

K

KANADE, TAKEO
Digit-Eyes: Vision-based human hand tracking
(NASA-CR-195913) p 237 N94-31447

KARR, MIKE
Beyond the read-eval loop: The artifacts system
(AD-A276589) p 238 N94-32034

KAUFMAN, JONATHAN W.
Validation and sensitivity analysis of Texas human thermal model predictions during cold water immersion
(AD-A275240) p 231 N94-32156

KIM, WON S.
Advanced teleoperation: Technology innovations and applications p 239 N94-32453

KLUTE, GLENN K.
Use of a pitch adjustable foot restraint system: Operator strength capability and load requirements
(NASA-TP-3477) p 240 N94-33050

KNILL, DAVID C.
Workshop on Visual Perception: Computation and Psychophysics
(AD-A278412) p 236 N94-33326

KOENIG, MARK A.
Investigation of drive-reinforcement learning and application of learning to flight control
(AD-A277442) p 236 N94-33053

KOLBER, Z.
Light utilization and photoinhibition of photosynthesis in marine phytoplankton
(DE94-005505) p 228 N94-32896

KRUISE, JANS
Perspectives of glucose sensing based on a charge-modulating competition reaction
(ISBN-9-09-005754-4) p 229 N94-31652

KUMAR, B. V.
A differential theory of learning for efficient statistical pattern recognition
(AD-A277313) p 234 N94-32277

L

LAWHORN, KATHY L.
Unit specific crew rest strategies: Phase 1 evaluation of the 1/212th Aviation Battalion during shiftwork transitions
(AD-A277122) p 239 N94-32379

LEWIS, N. G.
Towards a detailed understanding of the structural variability in lignins: A new approach
(DE94-007449) p 227 N94-32267

LIN, H. C.
Technology transfer of operator-in-the-loop simulation p 235 N94-32472

LIN, T. C.
Technology transfer of operator-in-the-loop simulation p 235 N94-32472

LOPEZ-KRAHE, JAIME
Fast nonsupervised 3D registration of PET and MR images of the brain
(TELECOM-93-C-006) p 232 N94-33069

LUNDGREN, CLAES
Effects of combined breathing impediments on diver's respiratory performance
(AD-A277437) p 240 N94-33064

M

MACKENZIE, COLIN F.
Development and enhancement of a model of performance and decision making under stress in a real life setting
(AD-A276029) p 233 N94-31440

MALONEY, LAURENCE T.
Visual neural development and chromatic aberration
(AD-A277402) p 234 N94-32345

MANGIN, JEAN-FRANCOIS
Fast nonsupervised 3D registration of PET and MR images of the brain
(TELECOM-93-C-006) p 232 N94-33069

MARASCO, PETER L.
Methods for measuring characteristics of night vision goggles
(AD-A277046) p 239 N94-32302

MCCARDIE, A. H.
Effects of methamphetamine and fatigue on long- and short-term memory
(AD-A276452) p 234 N94-32187

MCKEE, SUZANNE
Visual processing of object velocity and acceleration
(AD-A277425) p 236 N94-32998

MCKOON, GAIL
Reading: Interaction with memory
(AD-A277547) p 235 N94-32956

METZ, J. A. J.
On the reciprocal relationship between life histories and population dynamics
(CWI-AM-R9302) p 227 N94-32226
The legacy of Kermack and McKendrick
(CWI-AM-R9304) p 227 N94-32226

MILLER, NEAL E.
Autogenic-feedback training as a treatment for airsickness in high-performance military aircraft: Two case studies
(NASA-TM-108810) p 236 N94-33068

MILLINGTON, PETER J.
Investigation of drive-reinforcement learning and application of learning to flight control
(AD-A277442) p 236 N94-33053

MOURANT, J. R.
Noninvasive spectroscopic diagnosis of superficial ocular lesions and corneal infections
(DE94-006231) p 232 N94-32732

N

NERI, D. F.
Effects of methamphetamine and fatigue on long- and short-term memory
(AD-A276452) p 234 N94-32187

NISHI, R. Y.
Proceedings of the DCIEM Diver Thermal Protection Workshop
(DCIEM-92-10) p 230 N94-31738

NISHIOKA, NORMAN S.
Development of a video fluorescence system for assessing burn depth
(AD-A278127) p 232 N94-33092

NUNNELEY, SARAH A.
Aircrew Eye/Respiratory Protection (AERP): 16-hour extended wear evaluation of chemical protective equipment
(AD-A277268) p 240 N94-32609

O

OELTGEN, PETER R.
Characterization and utilization of opiate-like hibernation factors
(AD-A278136) p 229 N94-33098

P

PANDOLF, KENT B.
Numerical model of the thermal behavior of an extremity in a cold environment including counter-current heat exchange between the blood vessels
(AD-A278099) p 232 N94-33040

PARMENTIER, R. D.
Future directions of nonlinear dynamics in physical and biological systems. (Physica D nonlinear, volume 68, number 1)
(AD-A278085) p 229 N94-33250

PARRISH, JOHN A.
Development of a video fluorescence system for assessing burn depth
(AD-A278127) p 232 N94-33092

PAYER, ANDREW F.
Virtual reality in medical education and assessment p 231 N94-32471

PEARSON, JOHN
Models of the neuronal mechanisms of target localization of the barn owl
(AD-A277332) p 232 N94-32623

POLINER, JEFFREY
Use of a pitch adjustable foot restraint system: Operator strength capability and load requirements
(NASA-TP-3477) p 240 N94-33050

R

RASH, CLARENCE E.
Evaluation of intensity distribution profiles for US. Army rotorcraft position lighting adapted for image intensifier operations
(AD-A276459) p 238 N94-32171

REGAN, DAVID M.
Sensory sensitivities and discriminations and their roles in aviation
(AD-A277312) p 234 N94-32276

REHG, JAMES M.
Digit-Eyes: Vision-based human hand tracking
(NASA-CR-195913) p 237 N94-31447

REYNOLDS, G. T.
Development and application of photosensitive device systems to studies of biological and organic materials
(DE94-008503) p 228 N94-32516

REYNOSO, SAMUEL
Autogenic-feedback training as a treatment for airsickness in high-performance military aircraft: Two case studies
(NASA-TM-108810) p 236 N94-33068

RICHARDS, WHITMAN
Workshop on Visual Perception: Computation and Psychophysics
(AD-A278412) p 236 N94-33326

ROCK, PAUL B.
Medical problems in high mountain environments. A handbook for medical officers
(AD-A278095) p 233 N94-33266

ROITBLAT, HERBERT L.
From animals to animats
(AD-A277427) p 236 N94-33241

ROSS, BRIAN H.
Reminding-based learning
(AD-A277424) p 236 N94-32997

RUSSELL, ROBERTA L.
Aircrew Eye/Respiratory Protection (AERP): 16-hour extended wear evaluation of chemical protective equipment
(AD-A277268) p 240 N94-32609

S

SCHENKER, PAUL S.
Advanced teleoperation: Technology innovations and applications p 239 N94-32453
SHEFT, STANLEY
Determination of multiple sound sources
[AD-A277379] p 233 N94-32096
SHENDER, BARRY S.
Validation and sensitivity analysis of Texas human thermal model predictions during cold water immersion
[AD-A275240] p 231 N94-32156
SHIMADA, T.
Noninvasive spectroscopic diagnosis of superficial ocular lesions and corneal infections
[DE94-006231] p 232 N94-32732
SHITZER, AVRAHAM
Numerical model of the thermal behavior of an extremity in a cold environment including counter-current heat exchange between the blood vessels
[AD-A278099] p 232 N94-33040
SILVER, GEOFFREY
Development of a video fluorescence system for assessing burn depth
[AD-A278127] p 232 N94-33092
SKLET, S.
Systems for the monitoring of working conditions relating to health and safety: Extensive description. Norway
[PB94-138542] p 238 N94-31839
SNOOK, ELLEN H.
Evaluation of intensity distribution profiles for US Army rotorcraft position lighting adapted for image intensifier operations
[AD-A276459] p 236 N94-32171
SORKIN, ROBERT D.
Mechanisms of temporal pattern discrimination by human observers
[AD-A277407] p 235 N94-32577
SPENCER, JEFFREY B.
THE VERTICAL p 239 N94-32435
SPRAGUE, LAURIE A.
Virtual reality in medical education and assessment
p 231 N94-32471
STANNY, R. R.
Effects of methamphetamine and fatigue on long- and short-term memory
[AD-A276452] p 234 N94-32187
STEVENS, KENNITH W.
Analysis of pursuit tracking eye movements in pilots and nonfliers
[AD-A276597] p 233 N94-32035
STOREY-HELD, K.
Noninvasive spectroscopic diagnosis of superficial ocular lesions and corneal infections
[DE94-006231] p 232 N94-32732
STROSCHEIN, LEANDER A.
Numerical model of the thermal behavior of an extremity in a cold environment including counter-current heat exchange between the blood vessels
[AD-A278099] p 232 N94-33040
SULLIVAN, TIM
Virtual reality in medical education and assessment
p 231 N94-32471

T

TASK, HARRY L.
Methods for measuring characteristics of night vision goggles
[AD-A277046] p 239 N94-32302
TAYLOR, S. R.
Novel ultrasonic method for food hydration
[AD-A277411] p 239 N94-32580
THANGAVELU, MADHU
The Nomad Explorer assembly assist vehicle: An architecture for rapid global extraterrestrial base infrastructure establishment p 237 N94-31429
TOSCANO, WILLIAM B.
Autogenic-feedback training as a treatment for airsickness in high-performance military aircraft: Two case studies
[NASA-TM-108810] p 236 N94-33068
TOWERS, G. H. N.
Towards a detailed understanding of the structural variability in lignins: A new approach
[DE94-007449] p 227 N94-32267
TREASURYWALA, A. M.
A genetic algorithm based method for docking flexible molecules
[DE94-007525] p 227 N94-32269

V

VALLERAND, A. L.
Review of pharmacological approach to improve cold tolerance p 230 N94-31740
Lipid metabolism in cold-exposed humans
p 230 N94-31741
VANMOURIK, FRANK
Spectral inhomogeneity of the bacterial light-harvesting antennae: Causes and consequences
[DE94-06020] p 227 N94-31533
VITAL, PAUL
Numerical model of the thermal behavior of an extremity in a cold environment including counter-current heat exchange between the blood vessels
[AD-A278099] p 232 N94-33040
VOSS, MARK
Virtual reality in medical education and assessment
p 231 N94-32471

W

WEINSTEIN, J.
The magnesium chelation step in chlorophyll biosynthesis
[DE94-006727] p 228 N94-32690
WILMINGTON, ROBERT P.
Use of a pitch adjustable foot restraint system: Operator strength capability and load requirements
[NASA-TP-3477] p 240 N94-33050
WOODWARD, DONALD J.
Neostriatal neuronal activity and behavior
[AD-A278429] p 237 N94-33333

Y

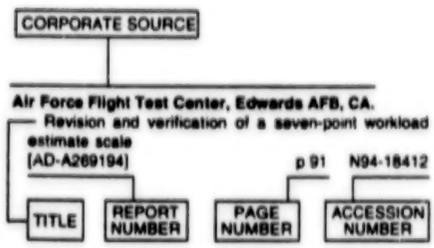
YAE, K. H.
Technology transfer of operator-in-the-loop simulation
p 235 N94-32472
YOST, WILLIAM A.
Determination of multiple sound sources
[AD-A277379] p 233 N94-32096

Z

ZOBEL, ANNETTE R.
Methods for measuring characteristics of night vision goggles
[AD-A277046] p 239 N94-32302

BLANK PAGE

Typical Corporate Source Index Listing



Listings in this index are arranged alphabetically by corporate source. The title of the document is used to provide a brief description of the subject matter. The page number and the accession number are included in each entry to assist the user in locating the abstract in the abstract section. If applicable, a report number is also included as an aid in identifying the document.

A

Acoustical Society of America, New York, NY.
Minutes: Accredited Standards Committee on Bioacoustics, S3. US TAG for ISO/TC 43, acoustics, IEC/TC 29 electroacoustics, and ISO/TC 108/SC4 human exposure to mechanical vibration and shock
[AD-A276201] p 229 N94-31490

Aerospace Medical Research Labs., Brooks AFB, TX.
Analysis of pursuit tracking eye movements in pilots and nonfliers
[AD-A276597] p 233 N94-32035

Aircrew Eye/Respiratory Protection (AERP): 16-hour extended wear evaluation of chemical protective equipment
[AD-A277288] p 240 N94-32609

Amsterdam Univ. (Netherlands).
Spectral inhomogeneity of the bacterial light-harvesting antennae: Causes and consequences
[ETN-94-96020] p 227 N94-31533

Army Aeromedical Research Lab., Fort Rucker, AL.
Evaluation of intensity distribution profiles for US. Army rotorcraft position lighting adapted for image intensifier operations
[AD-A276459] p 238 N94-32171

Unit specific crew rest strategies: Phase 1 evaluation of the 1/212th Aviation Battalion during shiftwork transitions
[AD-A277122] p 239 N94-32379

Army Research Inst. of Environmental Medicine, Natick, MA.
Numerical model of the thermal behavior of an extremity in a cold environment including counter-current heat exchange between the blood vessels
[AD-A278099] p 232 N94-33040

Medical problems in high mountain environments. A handbook for medical officers
[AD-A278095] p 233 N94-33268

B

Brookhaven National Lab., Upton, NY.
Light utilization and photoinhibition of photosynthesis in marine phytoplankton
[DE94-005505] p 228 N94-32896

C

California Univ., Santa Cruz.
Ninth International Workshop on Plant Membrane Biology
[DE94-005690] p 226 N94-32769

Carnegie-Mellon Univ., Pittsburgh, PA.
Digit-Eyes: Vision-based human hand tracking
[NASA-CR-195913] p 237 N94-31447

A differential theory of learning for efficient statistical pattern recognition
[AD-A277313] p 234 N94-32277

Center for Mathematics and Computer Science, Amsterdam (Netherlands).
On the reciprocal relationship between life histories and population dynamics
[CWI-AM-R9302] p 227 N94-32226

The legacy of Kermack and McKendrick
[CWI-AM-R9304] p 227 N94-32228

Clemson Univ., SC.
The magnesium chelation step in chlorophyll biosynthesis
[DE94-008727] p 228 N94-32890

Colorado Univ., Boulder.
Muscle disuse through tail-suspension: Etiology and therapeutics p 230 N94-31746

Connecticut Univ., Storrs.
Auditory perception
[AD-A277414] p 234 N94-32419

D

David Sarnoff Research Center, Princeton, NJ.
Models of the neuronal mechanisms of target localization of the barn owl
[AD-A277332] p 232 N94-32623

Defence and Civil Inst. of Environmental Medicine, North York (Ontario).
Proceedings of the DCIEM Diver Thermal Protection Workshop
[DCIEM-92-10] p 230 N94-31738

Defence and Civil Inst. of Environmental Medicine, Toronto (Ontario).
Review of pharmacological approach to improve cold tolerance p 230 N94-31740

Lipid metabolism in cold-exposed humans p 230 N94-31741

Draper (Charles Stark) Lab., Inc., Cambridge, MA.
Investigation of drive-reinforcement learning and application of learning to flight control
[AD-A277442] p 236 N94-33053

E

Ecole Nationale Superieure des Telecommunications, Paris (France).
Fast nonsupervised 3D registration of PET and MR images of the brain
[TELECOM-93-C-006] p 232 N94-33069

Ergonomic-Interface Keyboard Systems, Inc., La Jolla, CA.
THE VERTICAL p 239 N94-32435

F

Federal Aviation Administration, Cambridge, MA.
Cockpit Electronic Display Workshop: Proceedings (computer diskette)
[AD-M000330] p 241 N94-33171

Florida Univ., Gainesville.
Mechanisms of temporal pattern discrimination by human observers
[AD-A277407] p 235 N94-32577

H

Hawaii Univ., Honolulu.
From animals to animats
[AD-A277427] p 236 N94-33241

I

Illinois Univ., Urbana.
The organization of the suprachiasmatic circadian pacemaker of the rat and its regulation by neurotransmitters and modulators
[AD-A277324] p 228 N94-32622

Reminding-based learning
[AD-A277424] p 236 N94-32997

Illinois Univ., Urbana-Champaign.
Information theory for arm visuo-motor coordination p 235 N94-32495

J

Jet Propulsion Lab., California Inst. of Tech., Pasadena.
Advanced teleoperation: Technology innovations and applications p 239 N94-32453

K

Kentucky Univ., Lexington.
Characterization and utilization of opiate-like hibernation factors
[AD-A278136] p 229 N94-33098

L

Logicon Technical Services, Inc., Dayton, OH.
Methods for measuring characteristics of night vision goggles
[AD-A277046] p 239 N94-32302

Los Alamos National Lab., NM.
Noninvasive spectroscopic diagnosis of superficial ocular lesions and corneal infections
[DE94-006231] p 232 N94-32732

Loyola Univ., Chicago, IL.
Determination of multiple sound sources
[AD-A277379] p 233 N94-32096

M

Maryland Univ., Baltimore.
Development and enhancement of a model of performance and decision making under stress in a real life setting
[AD-A276029] p 233 N94-31440

Massachusetts General Hospital, Boston.
Development of a video fluorescence system for assessing burn depth
[AD-A278127] p 232 N94-33092

Massachusetts Inst. of Tech., Cambridge.
Model-based scientific discovery: A study in space bioengineering p 233 N94-31990

Michigan Univ., Ann Arbor.
Tripping over obstacles: Biomechanical analyses of how young and old try to avoid it p 238 N94-31954

Minnesota Univ., Minneapolis.
Workshop on Visual Perception: Computation and Psychophysics
[AD-A278412] p 236 N94-33326

SOURCE

850000

000027

N

National Aeronautics and Space Administration, Washington, DC.
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 388)
[NASA-SP-7011(388)] p 229 N94-31414
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 389)
[NASA-SP-7011(389)] p 231 N94-32347
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 385)
[NASA-SP-7011(385)] p 231 N94-32348
National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
The quest for contact
[NASA-TM-109778] p 241 N94-32389
An investigation of acoustic noise requirements for the Space Station centrifuge facility
[NASA-TM-108811] p 240 N94-32936
Autogenic-feedback training as a treatment for airsickness in high-performance military aircraft: Two case studies
[NASA-TM-108810] p 236 N94-33068
National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
Technology transfer of operator-in-the-loop simulation
p 235 N94-32472
National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
Virtual reality in medical education and assessment
p 231 N94-32471
Use of a pitch adjustable foot restraint system: Operator strength capability and load requirements
[NASA-TP-3477] p 240 N94-33050
Naval Aerospace Medical Research Lab., Pensacola, FL.
Effects of methamphetamine and fatigue on long- and short-term memory
[AD-A276452] p 234 N94-32187
Naval Air Warfare Center, Warminster, PA.
Validation and sensitivity analysis of Texas human thermal model predictions during cold water immersion
[AD-A275240] p 231 N94-32156
Naval Coastal Systems Center, Panama City, FL.
Thermotropic liquid crystals: A variable Clo material
p 238 N94-31739
New York Univ., New York.
Visual neural development and chromatic aberration
[AD-A277402] p 234 N94-32345
North Carolina Univ., Chapel Hill.
Visual encoding of spatial relations
[AD-A277400] p 234 N94-32344
Northwestern Univ., Evanston, IL.
Reading: Interaction with memory
[AD-A277547] p 235 N94-32956

P

Pacific Northwest Lab., Richland, WA.
The role of guideline-based design tools
[DE94-007482] p 240 N94-32596
Princeton Univ., NJ.
Development and application of photosensitive device systems to studies of biological and organic materials
[DE94-008503] p 228 N94-32516

S

Sandia National Labs., Livermore, CA.
A genetic algorithm based method for docking flexible molecules
[DE94-007525] p 227 N94-32269
Selskapet for Industriell og Teknisk Forskning, Trondheim (Norway).
Systems for the monitoring of working conditions relating to health and safety: Extensive description. Norway
[PB94-138542] p 238 N94-31839
Smith-Kettlewell Inst. of Visual Sciences, San Francisco, CA.
Visual processing of object velocity and acceleration
[AD-A277425] p 236 N94-32998
Software Options, Inc., Cambridge, MA.
Beyond the read-eval loop: The artifacts system
[AD-A276589] p 238 N94-32034
State Univ. of New York, Buffalo.
Effects of combined breathing impediments on diver's respiratory performance
[AD-A277437] p 240 N94-33084
State Univ. of New York, Stony Brook.
Isolating strain parameters correlated to skeletal adaptation
p 231 N94-31960

T

Taylor (S. R.) and Associates, Bartlesville, OK.
Novel ultrasonic method for food hydration
[AD-A277411] p 239 N94-32580
Technical Univ. of Denmark, Lyngby.
Future directions of nonlinear dynamics in physical and biological systems. (Physica D nonlinear, volume 68, number 1)
[AD-A278085] p 229 N94-33250
Technische Univ., Berlin (Germany).
Design of a logistics model for building and supporting a lunar station
[ILR-MITT-282(1993)] p 238 N94-31852
Toronto Univ. (Ontario).
Errors associated with the use of heat flow transducers
p 230 N94-31742

U

Umpqua Research Co., Myrtle Creek, OR.
Catalytic methods using molecular oxygen for treatment of PMMS and ECLSS waste streams, volume 2
[NASA-CR-190299] p 240 N94-32697
Universiteit Twente, Enschede (Netherlands).
Perspectives of glucose sensing based on a charge-modulating competition reaction
[ISBN-9-09-005754-4] p 229 N94-31852
University of Southern California, Los Angeles.
The Nomad Explorer assembly assist vehicle: An architecture for rapid global extraterrestrial base infrastructure establishment
p 237 N94-31429

W

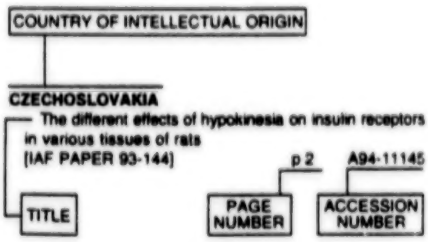
Wake Forest Univ., Winston-Salem, NC.
Neostriatal neuronal activity and behavior
[AD-A278429] p 237 N94-33333
Washington State Univ., Pullman.
Towards a detailed understanding of the structural variability in lignins: A new approach
[DE94-007449] p 227 N94-32267
Wright Lab., Wright-Patterson AFB, OH.
An experimental study of pilot/vehicle dynamics using a tilt rotor flying machine
[AD-A277516] p 241 N94-33349

Y

Yale Univ., New Haven, CT.
Stress-induced enhancement of the startle reflex
[AD-A278414] p 237 N94-33327
York Univ. (Ontario).
Sensory sensitivities and discriminations and their roles in aviation
[AD-A277312] p 234 N94-32276

000028

Typical Foreign Technology Index Listing



Listings in this index are arranged alphabetically by country of intellectual origin. The title of the document is used to provide a brief description of the subject matter. The page number and accession number are included in each entry to assist the user in locating the abstract in the abstract section. If applicable, a report number is also included as an aid in identifying the document.

C

CANADA

Proceedings of the DCIEM Diver Thermal Protection Workshop
[DCIEM-92-10] p 230 N94-31738

Thermotropic liquid crystals: A variable Clo material
p 238 N94-31739

Review of pharmacological approach to improve cold tolerance
p 230 N94-31740

Lipid metabolism in cold-exposed humans
p 230 N94-31741

Errors associated with the use of heat flow transducers
p 230 N94-31742

Sensory sensitivities and discriminations and their roles in aviation
[AD-A277312] p 234 N94-32276

F

FRANCE

Fast nonsupervised 3D registration of PET and MR images of the brain
[TELECOM-93-C-006] p 232 N94-33069

G

GERMANY

Design of a logistics model for building and supporting a lunar station
[ILR-MITT-282(1993)] p 238 N94-31852

N

NETHERLANDS

Spectral inhomogeneity of the bacterial light-harvesting antennae: Causes and consequences
[ETN-94-96020] p 227 N94-31533

Perspectives of glucose sensing based on a charge-modulating competition reaction
[ISBN-9-09-005754-4] p 229 N94-31652

On the reciprocal relationship between life histories and population dynamics
[CWI-AM-R9302] p 227 N94-32226

The legacy of Kermack and McKendrick
[CWI-AM-R9304] p 227 N94-32228

NORWAY

Systems for the monitoring of working conditions relating to health and safety: Extensive description. Norway
[PB94-138542] p 238 N94-31839

FOREIGN

000029

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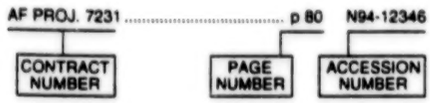
CONTRACT NUMBER INDEX

Typical Contract Number Index Listing



Listings in this index are arranged alphanumerically by contract number. Under each contract number the accession numbers denoting documents that have been produced as a result of research done under the contract are shown. The accession number denotes the number by which the citation is identified in the abstract section. Preceding the accession number is the page number on which the citation may be found.

AF PROJ. ILIR ..... p 233 N94-32035
AF PROJ. 7184 ..... p 239 N94-32302
AF PROJ. 7755 ..... p 233 N94-32035
AF-AFOSR-0035-91 ..... p 237 N94-33327
AF-AFOSR-0065-91 ..... p 235 N94-32577
AF-AFOSR-0080-91 ..... p 234 N94-32276
AF-AFOSR-0205-90 ..... p 228 N94-32622
AF-AFOSR-0246-90 ..... p 235 N94-32956
AF-AFOSR-0447-89 ..... p 236 N94-32997
AF-AFOSR-0551-89 ..... p 234 N94-32277
DA PROJ. 3M1-62787-A-874 ..... p 229 N94-33098
DA PROJ. 3M1-62787-A-879 ..... p 238 N94-32171
p 239 N94-32379
DA PROJ. 3M2-63004-D-805 ..... p 232 N94-33092
DAAK60-93-C-0020 ..... p 239 N94-32580
DAJA45-92-M-0163 ..... p 229 N94-33250
DAMD17-92-C-2026 ..... p 229 N94-33098
DAMD17-92-J-2019 ..... p 232 N94-33092
DE-AC02-76CH-00016 ..... p 228 N94-32896
DE-AC04-76DR-00789 ..... p 227 N94-32269
DE-AC06-76RL-01830 ..... p 240 N94-32596
DE-FG02-87ER-60522 ..... p 228 N94-32516
DE-FG03-92ER-20061 ..... p 228 N94-32769
DE-FG06-91ER-20022 ..... p 227 N94-32267
DE-FG09-89ER-13989 ..... p 228 N94-32890
EEC-SC1-0004-C ..... p 227 N94-31533
F33615-88-C-1740 ..... p 236 N94-33053
F49620-89-C-0131 ..... p 232 N94-32623
F49620-92-J-0114 ..... p 234 N94-32344
F49620-92-J-0156 ..... p 236 N94-32998
F49620-92-J-0187 ..... p 234 N94-32345
F49620-92-J-0301 ..... p 237 N94-33333
F49620-92-J-0489 ..... p 233 N94-32096
F49620-92-J-0530 ..... p 236 N94-33241
F49620-93-1-0070 ..... p 234 N94-32419
F49620-93-1-0124 ..... p 236 N94-33326
NAS8-38490 ..... p 240 N94-32697
NAS9-18800 ..... p 240 N94-33050
NGT-50559 ..... p 237 N94-31447
N00014-85-C-0710 ..... p 238 N94-32034
N00014-90-C-0024 ..... p 238 N94-32034
N00014-91-J-1540 ..... p 233 N94-31440
N00014-93-1-0509 ..... p 240 N94-33084
RTOP 199-70-12-14 ..... p 236 N94-33068
RTOP 960-60-90 ..... p 240 N94-32936
SBIR-12.02-5201(VOL-2) ..... p 240 N94-32697
W-7405-ENG-36 ..... p 232 N94-32732

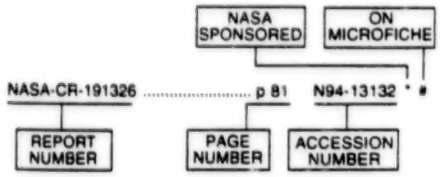
CONTRACT

000031

000031

BLANK PAGE

Typical Report Number Index Listing



Listings in this index are arranged alphanumerically by report number. The page number indicates the page on which the citation is located. The accession number denotes the number by which the citation is identified. An asterisk (*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche.

A-94048 ..... p 236 N94-33068 * #
A-94050 ..... p 240 N94-32936 * #

AD-A275240 ..... p 231 N94-32156 #
AD-A276029 ..... p 233 N94-31440 #
AD-A276201 ..... p 229 N94-31490 #
AD-A276417 ..... p 237 N94-31447 *
AD-A276452 ..... p 234 N94-32187 #
AD-A276459 ..... p 238 N94-32171 #
AD-A276589 ..... p 238 N94-32034
AD-A276597 ..... p 233 N94-32035
AD-A277046 ..... p 239 N94-32302
AD-A277122 ..... p 239 N94-32379 #
AD-A277288 ..... p 240 N94-32609
AD-A277312 ..... p 234 N94-32276
AD-A277313 ..... p 234 N94-32277
AD-A277324 ..... p 228 N94-32622
AD-A277332 ..... p 232 N94-32623
AD-A277379 ..... p 233 N94-32096
AD-A277400 ..... p 234 N94-32344
AD-A277402 ..... p 234 N94-32345 #
AD-A277407 ..... p 235 N94-32577 #
AD-A277411 ..... p 239 N94-32580
AD-A277414 ..... p 234 N94-32419
AD-A277424 ..... p 236 N94-32997 #
AD-A277425 ..... p 236 N94-32998 #
AD-A277427 ..... p 236 N94-33241
AD-A277437 ..... p 240 N94-33084
AD-A277442 ..... p 236 N94-33053
AD-A277516 ..... p 241 N94-33349
AD-A277547 ..... p 235 N94-32956 #
AD-A278085 ..... p 229 N94-33250
AD-A278095 ..... p 233 N94-33268
AD-A278099 ..... p 232 N94-33040 #
AD-A278127 ..... p 232 N94-33092
AD-A278136 ..... p 229 N94-33098 #
AD-A278412 ..... p 236 N94-33326
AD-A278414 ..... p 237 N94-33327 #
AD-A278429 ..... p 237 N94-33333

AD-M000330 ..... p 241 N94-33171

AFOSR-94-0047TR ..... p 228 N94-32622
AFOSR-94-0061 ..... p 232 N94-32623
AFOSR-94-0071TR ..... p 236 N94-33241
AFOSR-94-0073TR ..... p 234 N94-32277
AFOSR-94-0078TR ..... p 234 N94-32276
AFOSR-94-0097TR ..... p 235 N94-32956 #
AFOSR-94-0102TR ..... p 236 N94-32998 #
AFOSR-94-0105TR ..... p 234 N94-32419
AFOSR-94-0109TR ..... p 234 N94-32345 #
AFOSR-94-0115TR ..... p 234 N94-32344
AFOSR-94-0126TR ..... p 236 N94-32997 #
AFOSR-94-0127TR ..... p 233 N94-32096
AFOSR-94-0129TR ..... p 235 N94-32577 #
AFOSR-94-0173TR ..... p 237 N94-33327 #
AFOSR-94-0175TR ..... p 237 N94-33333
AFOSR-94-0219TR ..... p 236 N94-33326

AL-TP-1993-0014 ..... p 240 N94-32609

AL/AO-PC-1994-0003 ..... p 233 N94-32035

AL/CF-TR-1993-0177 ..... p 239 N94-32302

BNL-49821 ..... p 228 N94-32896 #

CMU-CS-93-220 ..... p 237 N94-31447 *

CONF-9207229 ..... p 228 N94-32769
CONF-9309312-1 ..... p 228 N94-32896 #
CONF-9310100-8 ..... p 240 N94-32596
CONF-940142-8 ..... p 232 N94-32732 #

CSDL-R-2575 ..... p 236 N94-33053

CTN-94-61181 ..... p 230 N94-31738

CWI-AM-R9302 ..... p 227 N94-32226
CWI-AM-R9304 ..... p 227 N94-32228

DCIEM-92-10 ..... p 230 N94-31738

DE94-005505 ..... p 228 N94-32896 #
DE94-005690 ..... p 228 N94-32769
DE94-006231 ..... p 232 N94-32732 #
DE94-007449 ..... p 227 N94-32267 #
DE94-007482 ..... p 240 N94-32596
DE94-007525 ..... p 227 N94-32269 #
DE94-008503 ..... p 228 N94-32516 #
DE94-008727 ..... p 228 N94-32890 #

DOE/ER-13989/4 ..... p 228 N94-32890 #
DOE/ER-20022/T1 ..... p 227 N94-32267 #
DOE/ER-60522/7 ..... p 228 N94-32516 #

DOT-VNTSC-FAA-93-21-CD ..... p 241 N94-33171

DOT/FAA/RD-93/42-CD ..... p 241 N94-33171

DSIS-92-03143 ..... p 230 N94-31738

ETN-94-95744 ..... p 238 N94-31852
ETN-94-95979 ..... p 232 N94-33069
ETN-94-96020 ..... p 227 N94-31533 #
ETN-94-96030 ..... p 229 N94-31652 #
ETN-94-96166 ..... p 227 N94-32226
ETN-94-96168 ..... p 227 N94-32228

ILR-MITT-262(1993) ..... p 238 N94-31852

ISBN-9-09-005754-4 ..... p 229 N94-31652 #

LA-UR-94-16 ..... p 232 N94-32732 #

NAMRL-1387 ..... p 234 N94-32187 #

NAS 1.15:108810 ..... p 236 N94-33068 * #
NAS 1.15:108811 ..... p 240 N94-32936 * #
NAS 1.21:7011(385) ..... p 231 N94-32348 *
NAS 1.21:7011(388) ..... p 229 N94-31414 *
NAS 1.21:7011(389) ..... p 231 N94-32347 *
NAS 1.26:190299 ..... p 240 N94-32697 * #
NAS 1.26:195913 ..... p 237 N94-31447 *
NAS 1.60:3477 ..... p 240 N94-33050 * #

NASA-CR-190299 ..... p 240 N94-32697 * #
NASA-CR-195913 ..... p 237 N94-31447 *

NASA-SP-7011(385) ..... p 231 N94-32348 *
NASA-SP-7011(388) ..... p 229 N94-31414 *
NASA-SP-7011(389) ..... p 231 N94-32347 *

NASA-TM-108810 ..... p 236 N94-33068 * #
NASA-TM-108811 ..... p 240 N94-32936 * #
NASA-TM-109778 ..... p 241 N94-32389 *

NASA-TP-3477 ..... p 240 N94-33050 * #

NATICK-TR-94/014 ..... p 239 N94-32580

NAWCADWAR-93069-60 ..... p 231 N94-32156 #

NONP-DTIC-DK-94-11178 ..... p 241 N94-33171

NONP-NASA-VT-94-9978 ..... p 241 N94-32389 *

PB94-138542 ..... p 238 N94-31839

PNL-SA-21969 ..... p 240 N94-32596

R/D-6891-MA-02 ..... p 229 N94-33250

S-764 ..... p 240 N94-33050 * #

SAND-93-8688 ..... p 227 N94-32269 #

STF75-A93042 ..... p 238 N94-31839

TELECOM-93-C-006 ..... p 232 N94-33069

USAARL-93-36 ..... p 238 N94-32171 #
USAARL-94-3 ..... p 239 N94-32379 #

USARIEM-TN94-2 ..... p 233 N94-33268

USARIEM-T94-10 ..... p 232 N94-33040 #

WL-TR-93-1153 ..... p 236 N94-33053
WL-TR-93-3063 ..... p 241 N94-33349

REPORT

000033

000033

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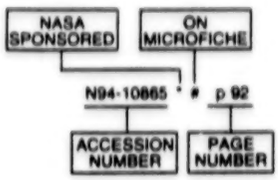

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N94-31414 * p 229
N94-31429 *# p 237
N94-31440 # p 233
N94-31447 * p 237
N94-31490 # p 229
N94-31533 # p 227
N94-31652 # p 229
N94-31738 p 230
N94-31739 p 238
N94-31740 p 230
N94-31741 p 230
N94-31742 p 230
N94-31746 p 230
N94-31839 p 238
N94-31852 p 238
N94-31954 p 238
N94-31960 p 231
N94-31990 p 233
N94-32034 p 238
N94-32035 p 233
N94-32096 p 233
N94-32156 # p 231
N94-32171 # p 238
N94-32187 # p 234
N94-32226 p 227
N94-32228 p 227
N94-32267 # p 227
N94-32269 # p 227
N94-32276 p 234
N94-32277 p 234
N94-32302 p 239
N94-32344 p 234
N94-32345 # p 234
N94-32347 * p 231
N94-32348 * p 231
N94-32379 # p 239
N94-32389 * p 241
N94-32419 p 234
N94-32435 *# p 239
N94-32453 *# p 239
N94-32471 *# p 231
N94-32472 *# p 235
N94-32495 p 235
N94-32516 # p 228
N94-32577 # p 235
N94-32580 p 239
N94-32598 p 240
N94-32609 p 240
N94-32622 p 228
N94-32623 p 232
N94-32697 *# p 240
N94-32732 # p 232
N94-32769 p 228
N94-32890 # p 228
N94-32896 # p 228
N94-32936 *# p 240
N94-32956 # p 235
N94-32997 # p 236
N94-32998 # p 236
N94-33040 # p 232
N94-33050 *# p 240
N94-33053 p 236
N94-33068 *# p 236
N94-33069 p 232
N94-33084 p 240
N94-33092 p 232
N94-33098 # p 229
N94-33171 p 241
N94-33241 p 236
N94-33250 p 229
N94-33268 p 233
N94-33326 p 236
N94-33327 # p 237
N94-33333 p 237
N94-33349 p 241

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1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
NASA SP-7011 (391)		

4. Title and Subtitle	5. Report Date
Aerospace Medicine and Biology A Continuing Bibliography (Supplement 391)	August 1994
	6. Performing Organization Code JTT
7. Author(s)	8. Performing Organization Report No.
	10. Work Unit No.
9. Performing Organization Name and Address NASA Scientific and Technical Information Program	11. Contract or Grant No.
12. Sponsoring Agency Name and Address National Aeronautics and Space Administration Washington, DC 20546-0001	13. Type of Report and Period Covered Special Publication
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15. Supplementary Notes

16. Abstract

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Aerospace Medicine Bibliographies Biological Effects	Unclassified - Unlimited Subject Category - 52

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
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